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USASC TECHNICAL REPORT
TR 79-3
MAY 1979

Analysis of FY 78 Army Aircraft Accidents

U.S. ARMY SAFETY CENTER

what happened
why it happened
what to do about it

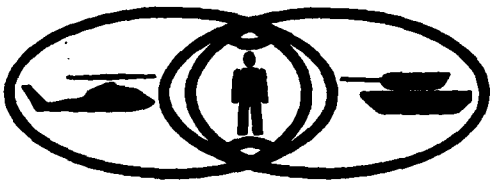
accident prevention guidance for aviation resource managers

LEVEL II

3W ANALYSIS OF FY 78 ARMY AIRCRAFT ACCIDENTS

Prepared By
G. Dwight Lindsey
William R. Brown

DIRECTORATE FOR
INVESTIGATION, ANALYSIS AND RESEARCH
COLONEL J. J. MIKUTA
Director



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Army aircraft accident data for FY 78 were analyzed. The major accident cause factors (hazards) were identified and ranked according to the magnitude of their effect and probability of occurrence. Prevention requirements based on the hazard analysis are discussed.

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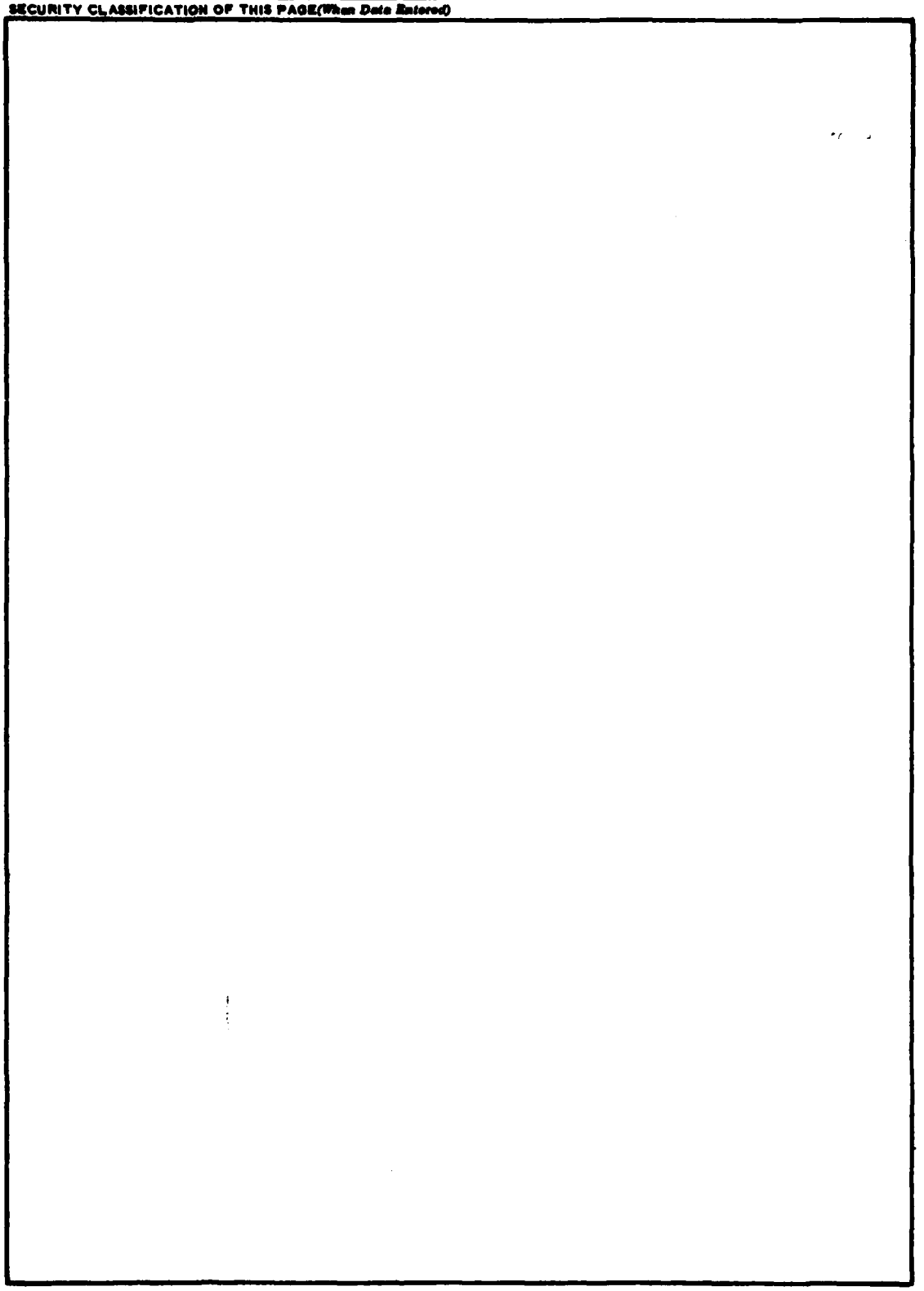

SUMMARY

A primary goal of Army aviation safety is to determine those factors that play a major role in aircraft accidents and identify the actions required to prevent their recurrence, i.e., what happened, what caused it to happen, and what to do about it--3W. This report is the third in a series of annual studies prepared in support of this goal. It is intended to provide information to all levels of Army management for the correction of system hazards that will best conserve aviation resources and maintain the highest level of operational mission effectiveness. This information should be particularly useful for trade-off decisions in areas where funds are limited for improvements in aircraft hardware and personnel training.

The data used for this report were obtained through a review/analysis of all Army aircraft accidents that occurred during fiscal year 1978 (FY 78). Out of 90 accident reports, there are 69 with sufficient information to be coded and analyzed according to the requirements of the 3W method (task error and materiel failure/malfunction analysis only). Twenty-seven different system inadequacies or hazards are identified. These are rank-ordered in decreasing order of significance based on frequency, severity of injury, damage to aircraft, and dollar losses. The top five hazards are (1) inadequate judgment , (2) improperly designed equipment, (3) inadequate written procedures, (4) inattention, and (5) inadequate motivation or mood. These are general hazard categories that are operationally defined and discussed in the report.

Prevention requirements or actions based on the FY 78 data fall into six general areas. These requirements are presented regardless of any actions taken or in progress. The primary requirements addressed under these areas are:

(1) reevaluate the OH-58 tail rotor and T63-A-700 engine to determine their adequacy for today's missions,

(2) develop a program to effectively reduce the problem of rotary wing aviators operating their aircraft at terrain flight altitudes when such flight is not mission required or authorized, and where the requirements of FM 1-1, Terrain Flight, are ignored,

(3) provide the OH-58 aircraft with an improved materiel design, i.e., heater/defogger system, landing lights, engine bearing outer race, engine power turbine shaft outer coupling nut, and fuel filter valve drain,

(4) investigate means for improving current methods of computing aircraft weight and balance and aircraft performance, and

(5) revise maintenance manuals to provide more specific guidelines regarding inspection and calibration procedures.

Other requirements indicated by the results are also discussed. These included

(1) Perform a multi-year hazard analysis study similar to this report.

(2) Conduct an LOH hazard analysis study to identify prevention requirements in current LOH aircraft as well as those relevant to the Advanced Scout Helicopter.

(3) Develop an aircraft flight/crash data recorder, and

(4) Establish an automated record of each aviator's flight activity.

Appendices to this report array information in several cross reference formats for ease of use by various management interests. For example, those interested in the task errors or materiel failures occurring in a particular type aircraft, i.e., utility helicopters, can use the information provided in appendices B and G. Task errors or materiel failures caused by a particular hazard, i.e., improperly designed equipment, can be found in appendices D and G.

CONTENTS

3W ANALYSIS OF FY 78 ARMY AIRCRAFT ACCIDENTS

INTRODUCTION

A primary goal of aircraft accident investigation, analysis and research is to find the causes of accidents and develop actions necessary to prevent similar occurrences. To better accomplish this goal, a special type of approach was developed for the analysis and reporting of accident investigations. This approach requires that each accident investigation determine what happened, what caused it to happen, and what to do about it (3W) with respect to man, machine or environment as definite cause factors. The "what caused or contributed to a failure" has been often overlooked in past accident report data. This systematic approach, termed the 3W approach, was used to analyze two prior years of accident data and resulted in two reports: Analysis of FY 76 Army Aircraft Accidents that Involved Human Error, March 1977 (reference 6), and Analysis of FY 77 Army Aircraft Accidents, January 1978 (reference 7).

Objectives: The ultimate goal of this effort is like that of System Safety Programs ... *to maintain the highest level of operational mission effectiveness through the conservation of aviation resources by early identification, evaluation, and correction of system hazards.* The following are objectives for attaining this goal:

1. Identify the significant* man and machine hazards in the Army aviation system.

2. Determine the most pressing hazard prevention requirements or actions.

3. Provide specific and detailed feedback to various levels of management regarding aviation hazards, suggested remedies, and actions in progress or completed to preclude recurrence.

Some of the intended uses of this report include (1) acting as a key element of information for use in system safety programs, (2) providing information to make Army level management cognizant of aviation hazards and prevention requirements, (3) identifying and directing research and development requirements for current and future aircraft, (4) determining areas of emphasis and needs for improvements in unit and school training, (5) identifying inadequacies and improvements needed in Army regulations, field manuals and other written guidelines that direct human behavior, and (6) providing feedback to unit and command personnel regarding aviation hazards and suggested remedies. This information should increase the

*Significant refers to the exclusion of suspected cause factors and the rank-ordering of definite cause factors in terms of importance for remedial action(s).

knowledge and awareness of current problem areas in the field environment, help maintain higher levels of interest in aviation safety, and act as a tool in the area of hazard prevention.

It is generally accepted that funding for improvements in aircraft hardware and personnel training will be minimal. The increase in sophistication and cost of future aircraft make it imperative that these limited funds be well spent. This report was designed to provide information to managers at all levels to help them optimize expenditures.

METHOD

A brief outline of the method used to prepare this report is presented below. A more detailed explanation of the method can be found in appendix F.

Data Source. Data used for this report was obtained by a review/analysis of all FY 78 Army aircraft accidents. As summarized in table 1, 69 accidents were analyzed according to the requirements of the 3W method. Twenty-one accident reports contained insufficient information to perform the required analysis, i.e., investigators could not identify definite failures or failure "causes" for man or machine. Also shown in the table are associated dollar costs that reflect personnel injury, aircraft damage and property damage.

TABLE 1.--FY 78 Army Aircraft Accidents

	Number	Cost
Accidents analyzed in this report	69	$19,191,478
Accidents with insufficient information to perform analysis	21	12,335,987
Total FY 78 Accidents	90	$31,527,465

Definitions And Terminology

Human Error or Task Error (TE) - Job performance which deviated from that required by the operational situation and caused or contributed to an accident. Required performance includes that stipulated by (1) school training, (2) on-the-job training, (3) U.S. Army regulations and guidelines, (4) standing operating procedures, or (5) commonly accepted practices. An error is assigned only when it is judged that a person of normal or reasonable competence could have performed the task correctly in the existing operational situation.

Materiel Failure/Malfunction (MF/M) - Component or system that (1) ceases to operate entirely, (2) operates, but not as designed or intended, (3) operates as designed, however, operational needs require enhanced performance. A materiel failure/malfunction is considered for analysis only when it is judged to have caused or contributed to the mishap, not resulted from the mishap.

Aviation Hazard or System Inadequacy (I) - Condition resulting from element of the aviation system not operating as intended or designed, and caused, allowed, or contributed to the occurrence of a task error or materiel failure. An aviation hazard consists of both man or machine failures and the associated cause factor.

Remedial Measure (RM) - Action required to correct or at least reduce the operational impact of an I. The RE may be directed at any command level for implementation and is not to be restricted by current technology or budgetary, personnel, and equipment resources.

Aircraft Accident - Damage that occurs to one or more aircraft wherein flight was intended.

Accident Cost - Combination of the dollar losses incurred as a result of aircraft damage, personnel injury and property damage.

Individual Analysis

As in prior years, the individual analysis of individual accidents to conform to 3W requirements was completed in accordance with the concepts and procedures outlined in chapter 11, AR 95-5, and as amplified in appendix F. These requirements were also discussed in the FY 77 3W report. Figure 1 shows the process used to analyze each accident.

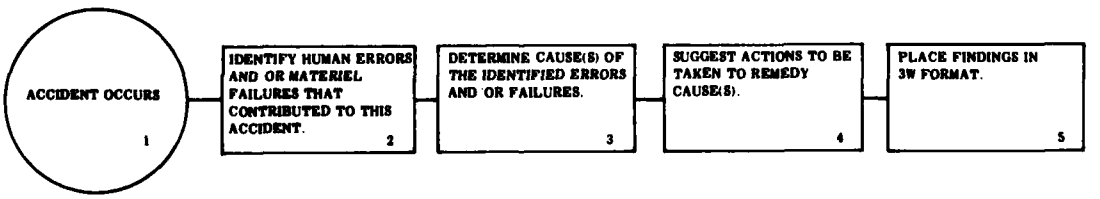

FIGURE 1.–Identification of Hazards in Each Individual Accident

The 3w approach is based on a conceptual framework adapted from a model by Ricketson, 1975 (reference 9). This approach requires each accident investigation board to identify what happened, what caused it to happen, and what to do about it with respect to man, machine, and the

environment as cause factors. In this report, only the man and machine aspects of 3W are examined (table 2).

TABLE 2.--3W Approach to the Investigation, Analysis, and Prevention of Accidents

Accident Cause	What Happened	What Caused It	What to Do About It	Acronym
Man	Task Error	System Inadequacies or hazards	Remedial Measures	TEIR
Machine	Failure or Malfunction	System Inadequacies or hazards	Remedial Measures	FIRE

Accidents involving human failures determined to be definite factors were subjected to TEIR analysis and those involving definite materiel malfunction or failures had a FIRE analysis performed. The models used for the human error accident and the materiel failure/malfunction accident are shown in figures 1 and 2 of appendix G. Information from the TEIR and FIRE analyses was then placed into a format designed for ease of coding and use for the collective analysis.

Collective Analysis. Figure 2 shows the process by which the collective analysis was accomplished.

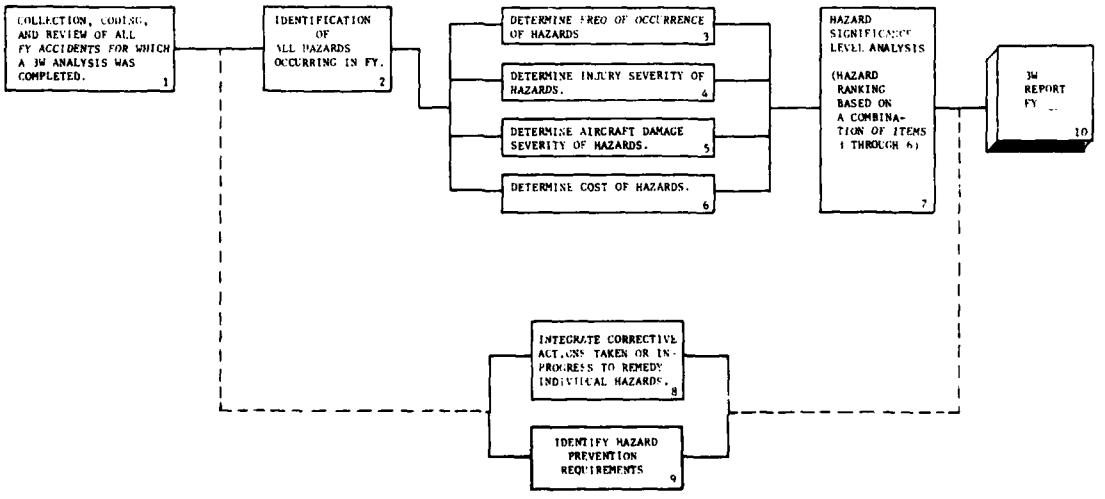

FIGURE 2.—Sequence of Overall Analysis

All of the TEIR and FIRE data was collected, reviewed, and coded for the collective analysis (item 1). This process resulted in the identification of all system inadequacies or hazards that were reported in FY 78 (item 2). Appendix G provides a detailed 3W description of each hazard by accident case in booklet form.

Rank Ordering of Hazards. The next step was to identify in order of importance the most significant aviation hazards. To accomplish this task, a hazard significance level (HSL) analysis was performed (item 7). The result of the HSL analysis is a rank-ordering or totem pole of hazards according to their overall significance. The criteria for the significance ranking were based on a combination of four variables...the frequency of hazard occurrence (item 3), personnel injury (item 4), aircraft damage severity (item 5), and the dollar loss costs (item 6).

A complete description of the HSL analysis is provided in appendix G. The rationale and format used to develop this analysis were modeled after reference 5, "System Safety Program Requirements," Mil Standard 882, 28 June 1977. A study titled "Engineering Analysis of Crash Injury in Army Aircraft" (see reference 8) also employed the same general methodology to examine crash injury and aircraft crashworthiness. In the future, these similar analyses of hazards during different accident phases may be consolidated into a single report.

Individual Hazard Prevention Requirements. Prevention actions taken or in progress to eliminate or reduce the impact of a hazard were identified, reviewed, and integrated with the 3W narratives on a case by case basis (appendix G). Consequently, appendix G of this report is an important safety tool in that it provides the following information about each accident case:

. the definite failures of man or machine

. the elements of the aviation system that caused or allowed the failures

. suggested remedial actions

. actions taken or in progress for prevention

Collective Hazard Prevention Requirement. The last step was to identify the most pressing hazard prevention requirements. Selection of these requirements was based on the HSL analysis and the expertise of safety professionals at USASC, e.g., engineers, human factors, investigators, and air safety specialists. Since it is not obvious to many, perhaps it should be noted here that many of the most effective remedies to prevent the recurrence of human related problems will often be found in the area of improved equipment design.

RESULTS AND DISCUSSION

Twenty-seven different system inadequacy or hazard categories were identified in the 69 aircraft accident reports containing 3W information. These hazards were then rank-ordered using the HSL analysis to determine overall level of importance for remedial action(s). The results of the analysis are provided in table 3. Hazards are listed in decreasing order of significance based on a combination of four variables...frequency of occurrence, severity of injury to man, severity of damage to aircraft, and accident cost. Keys to the below indices, significance grouping, and cost determination can be found in appendix F, pages F-8 and F-9. For instance, index "A" refers to a frequent occurrence, "I" indicates an injury severity level defined as fatal or life threatening, and "a" means resulting in a machine severity level of complete loss of aircraft.

TABLE 3.--Significance Levels or Ranking of System Hazards in Army Aircraft, FY 78

HAZARD NO.	SIGNIFICANCE GROUP	DESCRIPTION	INDICES			
			FREQUENCY	INJURY	DAMAGE	COST
1	1	Inadequate Judgment	A	I	a	2,529,531
2	2	Equipment not Available or Improperly Designed	B	I	a	2,946,945
3	2	Inadequate Written Procedures for Normal Operating Conditions	B	I	a	2,550,040
4	2	Inattention	B	I	a	1,942,997
5	3	Inadequate Motivation or Mood	C	I	a	754,269
6	4	Inadequate Unit Training	B	III	a	494,172
7	4	Overconfidence in Self	D	I	a	2,337,779
8	4	Maintenance Improperly Performed	D	I	a	1,158,664
9	4	Fatigue, Illness, Drugs	D	I	a	443,556
10	5	Environmental Influence	E	I	a	591,527
11	5	Inadequate Supervision by IP/SIP	D	II	a	340,527
12	5	Inadequate Written Procedures for Abnormal Operating Conditions	E	I	a	330,885

HAZARD NO.	SIGNIFICANCE GROUP	DESCRIPTION	INDICES FREQUENCY	INJURY	DAMAGE	COST
13	5	Overconfidence in Equipment	D	II	a	124,860
14	5	Inadequate Supervision by Unit Commander	D	II	a	117,359
15	6	Habit Interference	D	III	a	1,247,619
16	6	Inexperience	D	III	a	322,850
17	7	Lack of Confidence in Equipment	D	IV	a	330,455
18	7	Inadequate Composure	E	III	a	315,730
19	7	Overconfidence in Others	D	III	b	102,667
20	7	Inadequate School Training	D	IV	a	71,179
21	7	Inadequate Manufacture, Assembly, Quality Control	D	III	b	60,303
22	7	Inadequate Supervision by Higher Command	D	III	b	30,692
23	8	Inadequate Supervision by Operations Officer	E	III	b	23,365
24	8	Inadequate Supervision by Flight Leader	D	IV	b	14,751
25	8	Inadequate Supervision by Weight & Balance Officer	D	IV	b	1,324
26	9	Lack of Confidence in Self	E	IV	b	1,125
27	10	Inadequate Facilities	E	IV	c	6,000

Top Five System Hazards

A general discussion of the top five aviation hazards is presented in this section. More specific information can be obtained through a detailed examination of each case within a hazard category. Figure 3 shows the relationship of these hazards according to frequency and accident cost. Note that equipment design problems occurred less frequently than others but accounted for the greatest dollar losses.

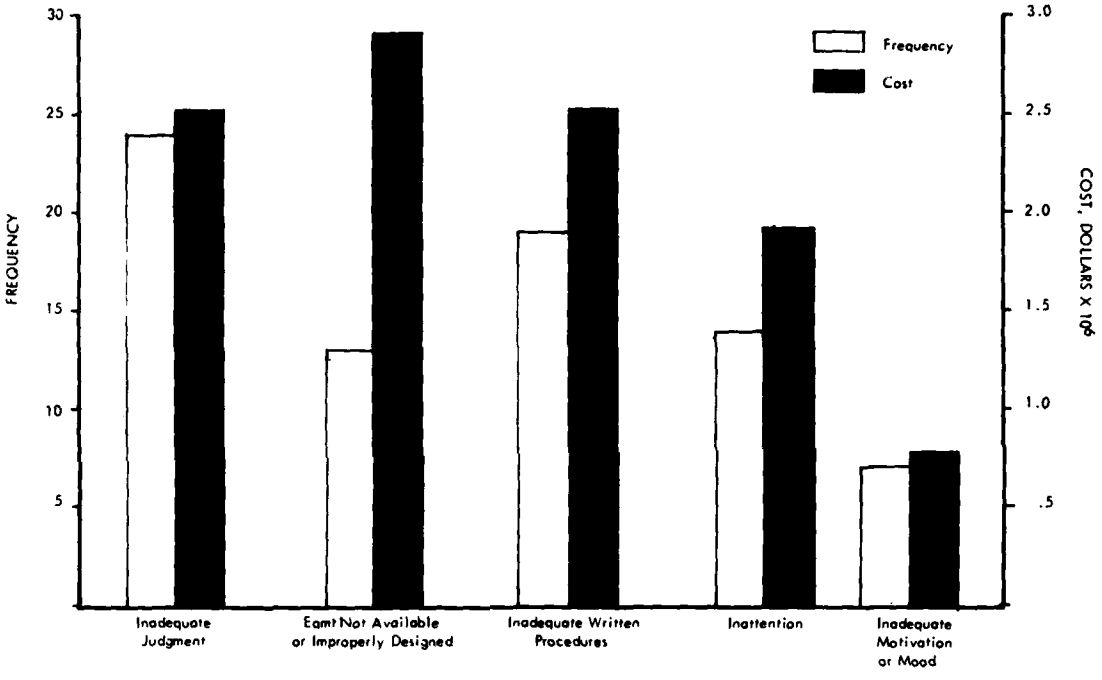

FIGURE 3.–Frequency and Cost of Top Five Hazards

I. Inadequate Judgment. The HSL analysis indicates that *inadequate judgment* was the most critical hazard found in Army aviation accidents during FY 78. It contributed over 2.5 million dollars to FY 78 accident costs.

No materiel failures were related to inadequate judgment, i.e., engine failure against which pilot exercised poor judgment in selection and application of emergency procedures. The task errors caused or contributed to by inadequate judgment are ranked by frequency in table 4. Two basic errors generally identified with this hazard* were "performing a prohibited

*NOTE: As this report was being prepared, four FY 79 accidents occurred which fall into this hazard category.

course of action at low levels above the terrain" and "failing to perform a required course of action during landing." As shown in table 4, the remaining task errors had a frequency of two or less.

TABLE 4.--Inadequate Judgment

RANK	FREQ	MATERIEL FAILURE OR TASK ERROR
A	11	Performed prohibited course of action by flying unauthorized flight or maneuver at low levels and striking wires or trees.
B	4	Failed to perform required in-flight action during landing.
C	2	Inadequate preflight planning - power available vs power required.
C	2	Inaccurately estimated clearance/closure rate during landing.
D	1	Improper flight control action during practice autorotation.
D	1	Improperly monitored performance by IP during practice autorotative landing.
D	1	Performed a prohibited flight control action during practice autorotation.
D	1	Authorized prohibited course of action at low-level flight altitude.
D	1	Improperly assigned personnel to unit training mission.

All of the accidents in this category involved some type of failure during a landing or flight at low level above the terrain. In particular, these flights at low level were most often performed by pilots of LOH aircraft on unit training missions. It is unusual that inadequate judgment occurred in more LOH aircraft than in all other aircraft combined. This is somewhat surprising since LOH aircraft do not have as great an exposure to risk in terms of number of flying hours and number of aircraft in the fleet as do utility aircraft alone.

The failures in table 4 are not new to Army aviation. They involve two types of decision-making ... estimations of speed, height and distance, and assessment of aircraft/aviator capability at low levels. It causes one to speculate about the chronic nature of their occurrence ... "Why do these problems continue to occur in Army aviation?" "Why do pilots

continue to have problems in judging the capability of the aircraft with regard to power required versus power available?" "Why do we continue to have a number of training flight accidents in which the pilot inadequately judges closure rate and pulls collective pitch too late during practice autorotations?" "Why do pilots continue to fly unauthorized low level flights?" "Are our pilots just committing dumb mistakes?"

These and other questions regarding inadequate judgment of pilots are not new and should be thoroughly researched to identify why they continue to occur, at what magnitude, and the best method(s) of prevention. The "inadequate judgment" problem should not be "blamed" on pilots. After sufficient research into this identified problem area, some of the causes and cures may very well be found in the area of equipment design or training.

Following are some areas where research could be fruitfully applied:

. Assessing the capability of pilots to adequately determine power available versus power required under certain low level conditions with the instruments currently available in our rotary wing fleet.

. Improving R/W equipment design or instructor pilot procedures that will alleviate problems of pulling collective pitch too late or too soon during practice autorotations.

. Examining the adequacy of regulations governing terrain flight altitudes when flight at such altitudes is not required by the mission or circumstances.

. Determining the level of encouragement and discouragement aviators generally receive with respect to unauthorized low level flights.

. Determining the feasibility, practicality and cost effectiveness of wire protection/cutting devices or a wire (or wirelike object) warning system.

. Examining the need for a low airspeed/ground speed indicating system for Army aircraft.

. Determining the adequacy of the OH-58A (engine power and tail rotor threat) to fly or perform the required low level or NOE type missions especially under "hot day" type conditions.

II. Equipment not available or improperly designed for required operation.

Equipment design was the second ranked hazard. This category includes human as well as materiel failures caused by the inadequate design of equipment. Although equipment problems occurred in accidents less frequently than other hazards, it resulted in the highest dollar losses (see figure 3).

Five of the nine materiel failures that were caused or allowed by equipment being improperly designed occurred in engines and/or fuel systems, two occurred in the antitorque system, and one each in the heater/defogger and mast system. The types of human error(s) and machine failures caused by improperly designed equipment were widely distributed (see table 5).

TABLE 5.--Improperly Designed Equipment

RANK	FREQ	MATERIEL FAILURE OR TASK ERROR
A	9	Machine Related
		OH-58A power turbine shaft outer coupling nut failed because nut is made of materiel that corrodes easily.
		OH-58A heater defogger failed to clear windows resulting in insufficient visual cues.
		OH-58A fuel system (fuel filter) allows water to build up and then be ingested in engine.
		OH-58A #2 bearing failed because outer race is a split design which allows misalignment resulting in progressive fatigue failures (spalling).
		OH-58A tail rotor blade separated because blade retention block design causes a burr at the tip of the tang, which in turn acts as a stress riser.
		OH-58A tail rotor failed to provide enough thrust under low airspeed, OGE hover, high gross weight, and "hot day" conditions.
		AH-1S P-1 connector adjusting screw failed because vibration from bellows area causes high cycle fatigue.
		UH-1H P-1 multiplier failed because resonant vibration caused reverse bending at brazed point on rod.
		UH-1H experienced mast failure because flight outside rather narrow envelope (easy to attain) results in mast bumping.

RANK	FREQ	MATERIEL FAILURE OR TASK ERROR
B	4	MAN RELATED

OH-58A pilot failed to use landing light during steep approach because light causes too much glare.

UH-1H pilot improperly read torque indicator because it is graduated in increments of 5 PSI and is required to be read at 1 PSI increments.

UH-1H pilot applied improper flight control action because he required low airspeed information. The UH-1 does not have such an instrument (low airspeed indicator).

UH-1H pilot, without outside visual cues for reference, applied improper flight control action because of an inaccurate barometric altimeter.

Over half of the improperly designed components were in OH-58A aircraft. Thus, like "inadequate judgment," the LOH type was the primary aircraft involved, even though it has less flying hours and fewer number of aircraft in the inventory than the utility helicopter.

A review of this hazard did not reveal any single aircraft component in any system that failed more often than any other. Each instance was somewhat unique and should be considered on its own merit for prevention actions. A review of this system hazard points out some additional areas in which further research might be beneficial.

1. Determine why the OH-58A aircraft system was identified so frequently as having equipment design inadequacies.

2. There were 11 fixed wing accidents in FY 78, yet no equipment design problems were noted. Does this mean that fixed wing systems are better designed or do failures in fixed wing aircraft result in less damage thereby not showing up as accidents? Or does it mean that accident investigations seldom reveal materiel design problems?

3. How do equipment design or availability problems differ from other system problems, i.e., associated accident costs and injuries?

III. Inadequate written procedures for operation in the normal man-machine environmental conditions. This hazard was ranked third by the HSL analysis. "Normal man-machine-environmental condition" refers to those written procedures dealing with normal operating conditions (NOC) as opposed to those written to govern emergencies. Inadequate written procedures (NOC) contributed $2,550,040 to accident costs.

The most frequent problem concerning this hazard was in the area of maintenance procedures (see table 6). These inadequacies in instructions/ procedures for maintenance were generally related to inspection or calibration procedures. The second most important problem in this area was in the operators manuals of the LOH and Utility helicopter systems. Inadequate written procedures found in these manuals resulted in seven errors made by pilots and crew chiefs that contributed to accidents. The problem noted concerning these written procedures was that the instructions were either too general or the manual did not contain the required instructions.

TABLE 6.--Inadequate Written Procedures for Normal Operations

RANK	FREQ	MATERIEL FAILURE OR ERROR
A	8	Inadequate written procedures for inspection/calibration of materiel systems.
B	7	Inadequate written instructions/procedures in aircraft operators manuals.
C	2	U-21 rated student pilot and instructor pilot landed gear up following an attempted single engine procedure during takeoff. They were confused over what procedure to follow because the U-21 Flight Training Guide and the U-21 -10 differ on the required procedure to follow.
D	1	OH-58A pilot attempted night landing to a single light source. The unit SOP did not conform to TC 1-28 requiring use of a lighted "T" or "Y" for night landings.
D	1	UH-1H jumpmaster failed to disarm automatic opening device on parachute when jump was aborted and descent begun. Instructions in AR 95-19 were incomplete.

Inadequate written procedures appeared to be associated with utility and observation aircraft more than any other. These inadequate guidelines appeared to group into two general areas: (1) inadequate maintenance procedures in the area of inspection and calibration, and (2) inadequate procedures in operators manuals and Flight Training Guides. Since maintenance and operators manuals provide important guidelines for directing behavior, it is essential that action be taken to insure that the inadequacies noted above be eliminated.

A review of the cases involved also suggest certain areas in which further research is needed:

- Why is it that the majority of the inadequate written procedures occurred in two aircraft systems (UH-1 & OH-58A) that have been in the Army inventory for so many years?

- Do the operator and maintenance manuals have adequate readability and understandability levels for the intended users?

- Why do OH-58 pilots misinterpret a loss of tail rotor effectiveness as an antitorque failure or as "settling with power" and take inappropriate actions(s)?

IV. Inattention. The hazard ranked fourth in the analysis was *inattention.* Inattention as a definite factor in accidents accounted for $1,942,997 in resource losses.

Like *inadequate judgment,* materiel failures were not related to inattention. The task errors caused or contributed to by inattention were committed by experienced aviators and are ranked by frequency in table 7. The two basic errors generally identified with this hazard were "improper flight control action(s) during landing or flight at low level altitude" and "instructor pilot improperly monitoring the performance of personnel while hovering, taking off or landing during school training or unit standardization flight." Other task errors had a frequency of two or less (table 7).

TABLE 7.--Inattention

RANK	FREQ	MATERIEL FAILURE OR TASK ERROR
A	4	Improper flight control action(s) during landing or flight at low levels above the terrain.
A	4	IP improperly monitored performance of personnel while hovering, taking off, or landing during school training or unit standardization flight.
B	2	Misinterpreted in-flight aircraft action as tail rotor failure.
B	2	Improperly monitored instruments or performance of equipment during takeoff or hover.
C	1	Inaccurately estimated clearance/closure during autorotation.
C	1	Improperly performed or failed to perform course of action required by written guidelines during takeoff check

Accidents involving this hazard occurred when the pilot's task loading was high, i.e., during hover, landing, takeoff and low level flight. The aircraft primarily involved were utility and light observation R/W. Results of inattention generally involved loss of directional control or incorrect application of collective pitch during autorotation. In most cases, the task errors were of pilots and instructor pilots who channelized or improperly divided their attention on events taking place or objects located outside and inside the cockpit. Maps, instruments and instructions by the other aviator aboard are examples of items inside the cockpit on which their attention was channelized. Other aircraft, ground personnel, and the area selected for landing are examples of items that attracted their attention outside the cockpit.

This problem was distributed across aviators without regard to their flight experience. Research is needed in the areas of assessments of the aviators' workload, task vigilance limits and instrumentation to provide needed information.

A relevant question in this regard is "what is optimum in the way of dividing attention between tasks inside and outside the aircraft when the task loading is at or near its peak?" Traditionally, this question has been ignored because it has been much easier to cite the pilot for inattention. As a consequence, aviators are often caught in a "Catch-22" situation. In these instances, the aviators find themselves equally liable to attend to tasks of equal priority that occur simultaneously inside and outside of the cockpit.

Inattention was the fourth ranked hazard of FY 78. A requirement exists to isolate the causes of inattention during periods of high task loading as in low level flight and what can be done to avoid its occurrence. Like inadequate judgment mentioned previously, many of its causes and cures are likely to be found in the area of equipment design or training. The "heads-up display" is an example of the type of equipment that merits attention.

V. Inadequate mood or motivation: command pressure, excessive self motivation, get-home-itis, peer pressure. This hazard ranked fifth in the HSL analysis and it contributed $494,172 to FY 78 accident costs.

The two general types of errors caused by this hazard involved aircrews and supervisors. In each case the cause of the error was either excessive self motivation, command or peer pressure (table 8).

TABLE 8.--Inadequate Motivation or Mood

RANK	FREQ	MATERIEL FAILURE OR TASK ERROR
A	4	FAILURES AT AIRCREW LEVEL
		UH-1H CP inaccurately estimated clearance on approach to uncleared area and struck trees because he was excessively self motivated. CP was being considered for appointment as PIC and wanted to make a good impression on the pilot.
		OH-6A pilot performed NOE flight when not NOE trained (struck trees) because he was excessively self motivated. Pilot was supporting a unit to which he was not assigned and wanted to make good impression.
		OH-6A pilot performed NOE flight when not NOE trained (struck trees) because of peer pressure. Other personnel, during practice for ARTEP, criticized higher altitudes being flown and emphasized need to fly more tactically realistic low altitudes.
		OH-58A pilot failed to plan NOE route prior to flight (struck wires) because of excessive self motivation. He had a false sense of urgency because "enemy" tanks were close by.
B	3	FAILURES AT SUPERVISORY LEVEL
		OH-58A IP flew an NOE mission at excessive airspeed (60 KIAS) because of excessive self-motivation (struck wires). He had a false sense of urgency because "enemy" tanks were close by.
		Local commander failed to provide crew rest policy because of excessive self motivation. He felt mission accomplishment was more important than crew rest policies. OH-58 aviators with 12-15 hours rest and 22-28 flight hours in last 72 hours struck wires.
		Because of command pressure, platoon leader assigned two aviators to a mission for which they had not been trained.

All accidents in which this hazard was a cause factor occurred during unit mission training (FTX, ARTEP, etc.) and were generally related to aircrew or supervisory failures. Possible areas of research include:

1. Assessment of various field training exercises to determine those specific events which allow or induce aviators and supervisors through a false sense of urgency or emphasis to become so concerned with mission accomplishment that they forget or disregard safe operating practices, i.e., crew rest limitations.

2. Development of a program aimed at the prevention of those conditions identified as allowing or inducing disregard for safe operating conditions.

IDENTIFICATION OF HAZARD PREVENTION REQUIREMENTS

Unit Level. Remedial actions or prevention requirements for which a unit has primary control for implementation are provided on a case by case basis in appendix G. The appendix provides indepth information for individual unit problems as well as Army-wide aviation problems. The type and amount of information in appendix G is intended to provide unit level personnel with the means to perform different kinds of analyses of hazards unique to the primary concerns of a unit, i.e., problems in utility helicopters. As a result, lessons will be learned and prevention requirements will become known. The suggested remedial actions should be carefully considered, but are not intended to (1) be all inclusive, (2) represent remedial actions that an expert, e.g., an aerospace engineer or aviation psychologist might select, or (3) be identical to remedial actions selected when examining the collective nature of an accident problem area. Note that appendix G also includes feedback information regarding actions that have been completed or that are in progress to prevent or reduce the recurrence of a hazard.

Management Level. The rank-ordered listing of aviation hazards shown in table 3 was analyzed to determine pressing prevention requirements over which an aviation unit has little control, but which affect the efficiency and safety of operations. A listing of these requirements is provided in table 9. Selection of these requirements is based on the HSL analysis, and the judgment of human factors specialists and aircraft system managers at USASC. This listing, which generally fell into six categories, represents the needs of FY 78 regardless of any actions taken or in progress toward prevention. As noted earlier, many of the most effective remedies to prevent the recurrence of human related problems are found in the area of improved equipment design.

TABLE 9.--Hazard Prevention Requirements for Army Aviation

Requirement Area	Hazards Addressed By Requirement (reference table 3)
A. LOH Tail Rotor and Engine Reevaluation of the OH-58 tail rotor and T63-A-700 engine to determine their adequacy for today's missions. Special emphasis should be focused on aircraft operational capabilities versus mission requirements for flights at low altitudes, low airspeeds, high gross weights, under hot day conditions with winds varying in direction and velocity.	1,2,3,4,13

Requirement Area	Hazards Addressed By Requirement (reference table 3)
Incorporate in observation helicopter operators manual adequate explanations, charts, cautions and emergency procedures as they apply to problems involving loss of tail rotor effectiveness, settling with power, and conditions under which each can be experienced.	1,2,3,4,13 (cont'd)
Upgrade aviator training to provide complete understanding of aircraft performance capabilities in the area of (1) power required versus power available (2) interpretation of tail rotor problems and (3) actions to take when tail rotor effectiveness is lost.	
Evaluate the capability of rotary wing aviators to assess power available versus power required under various low level flight conditions with instrumentation currently available in Army helicopters and with current training requirements.	
Complete installation of the improved tail rotor for OH-6 aircraft.	
Remove all OH-58A tail rotor blades prior to serial number TLL-8000 and replace with blade that incorporates improved blade retention block.	
Recommend operational release of the OH-58C helicopter be contingent upon continued efforts to improve directional control and that the operators manual be revised to adequately explain and caution against insufficient and antitorque control under certain conditions, e.g., NOE, hot day conditions/environment.	

Requirement Area	Hazards Addressed By Requirement (Reference Table 3)
B. Low Level or NOE Flight/Maneuver	1,5,14
Develop a program aimed at reducing the problem of R/W aviators operating their aircraft at terrain flight altitudes when such flight is not mission required or authorized and where the requirements of FM 1-1, Terrain Flight, are ignored. Such a program should include an examination as to why (e.g., attitudes, perceptions) some aviators perform in that manner; evaluate the degree of emphasis for enforcement of existing terrain flight guidance as it affects the pilot.	
Determine the feasibility, practicality and cost-effectiveness of equipping Army rotary wing aircraft with (1) a wire or wire-like object detection system and/or (2) a type of wire protection/cutting device.	
Review current regulations and manuals to determine the adequacy of guidance provided to aviators and supervisors with regard to the conduct of terrain flight.	
C. Estimation of Speed, Height and Distance	1,2,3,8
Develop research effort to determine the instruments/procedures/training techniques needed to enhance pilot capability to accurately estimate clearance/closure rate and correct control inputs, especially during autorotations.	
Evaluate the feasibility of providing R/W aircraft with a reliable low airspeed/ground speed indicating system.	

Requirement Area	Hazards Addressed By Requirement (reference table 3)
Evaluate the feasibility of providing R/W aircraft with an improved altimeter, e.g., radar altimeter designed to meet the requirements of Army R/W aircraft and the types of missions flown by these aircraft.	1,2,3,8 (cont'd)
D. Equipment Design (Other)	1,2,3,8
Provide improved OH-58A landing light, i.e., adjustable landing light for directional control.	
Complete the requirement to add silicone oil to all T53-L-13B and L703 engine fuel controls to dampen drive shaft generated vibration. Expedite modifications to the Model TA7 configuration, i.e., stainless steel bellows.	
Expedite purging of dark colored brittle tail rotor pitch chains from the supply system. Eventual elimination of this problem requires continued and expeditious modification of the AH-1G aircraft to the AH-1S push-pull type of controls.	
Improve the OH-58 heater/defogger system.	
Provide the OH-58 fuel filter with a drain valve similar to that installed in the Bell 206 to prevent water build-up and ingestion into the engine.	
Improve T-63-A-700 engine split bearing outer race (PN: 6876008) to a design that does not allow misalignment and progressive fatigue failures (spalling) of bearings.	
Improve T-63-A-700 engine power turbine shaft outer coupling nut (PN: 6846278) to a noncorrosive material.	

Requirement Area	Hazards Addressed By Requirement (reference table 3)
Investigate unexplained hydraulic malfunctions in AH-1 aircraft.	1,2,3,8 (cont'd)
E. Weight & Balance	1,3,9,11,14
Investigate methods/instruments for improving the calculation of weight and balance and aircraft performance, i.e., better performance charts and electronic computer.	
Revise R/W operators manual to contain specific weights for combat equipped troops to be used for weight and balance calculations. Include the weight of combat equipped troops as a question on the annual written examination.	
F. Inadequate Written Procedures (Other)	3
Revise UH-1 maintenance manual to require inspection of tail rotor output quill flex coupling for lubrication prior to installation of new or overhauled main transmission.	
Revise UH-1 operators manual to require power checks at hover taking cross winds and tail winds into consideration for go, no-go conditions.	
Develop procedures on how TEAC should be performed for engine trimming during periods of cold weather for inclusion in UH-1/ AH-1 helicopter maintenance manuals.	

Requirement Area	Hazards Addressed By Requirement (reference table 3)
Establish written procedures and implement a plan that will require units to acquire repair parts in accordance with the source codes in the parts manuals. Establish procedures wherein requests to locally manufacture items normally requisitioned are evaluated in light of the requestor's ability to manufacture the part to specifications. (For example, an accident resulted when a unit locally manufactured a Pc airline for an OH-58 without manufacturer specifications. As a result, bend angles for the line were not correct; failure occurred after two flight hours resulting in an aircraft accident.)	3 (cont'd)
Revise UH-1 maintenance manual to require aircraft torque indicating systems to be calibrated periodically, e.g., during maintenance inspection.	

The requirements listed above provide insight into safety needs and each should be closely monitored and managed. Following are areas in which these requirements should be considered:

1. Research and development for current and future aircraft.

2. Determining areas of emphasis and direction for upgrading training at unit and school levels.

3. Developing unit & Army-wide accident prevention programs.

4. Evaluating and revising Army regulations, technical manuals, field manuals, and other written guidelines that direct human behavior.

Additional Requirements. The results of this study indicate support for six additional requirements. A longitudinal type study similar to this report should be performed to determine system hazards and prevention requirements based on more than one year of accident data. Additionally, consideration should be given to developing research efforts aimed at providing an indepth analysis for each aircraft system and each of the major aviation hazards identified in this report.

The two top level hazards identified by the HSL analysis occurred for the most part in observation helicopters. Consequently, a research effort is needed to analyze Army accident experience over several years of data to identify the major man and materiel problems and prevention requirements for these helicopters. This effort should determine those hazards that also may be common to the advanced scout helicopter (ASH), and identify the most pressing safety requirements.

One of the most common recommendations made by accident investigation boards was "to inform personnel of problems encountered through communications media." Communications media like FlightFax are invaluable for providing feedback to field personnel regarding the aviation hazards. The data in this report support the need for USASC to insure current efforts are not reduced in addressing the major aviation hazards through articles, publications, training films and other communications media.

The final two needs suggested by the results of this study involve aids to accident investigation and analysis. Like those of previous years, this analysis indicates the requirement for an improvement in the quality and specificity of data, i.e., "real time" data. Without an improvement in the data, the repeated appearance of many accident causes will continue, and few safety improvements or advancements will be realized beyond the present plateau. Two means of substantially improving the quality and quantity of data would be an on-board flight/crash data recorder and automation of aviator flight activity. An on-board crash data recorder would for the first time provide invaluable "real time" information about the aircraft. This would reduce (1) subjective "guess-timations," speculations, and other imprecise techniques currently in use, (2) the number of general observations that may be inaccurate and erroneous because of the historical nature of accident data, and (3) the number of accidents in which insufficient information was available to determine definite causes. Thirty-nine percent of the accident costs during FY 78 were incurred in accidents having insufficient information for the analysis.

Automation of the aviators' flight activities would improve the accuracy and speed with which such valuable information can be gathered. More importantly, it would allow comparative types of analysis, i.e., between aviators who have had accidents and those who have not had accidents, or between aviators committing different types of errors in flight tasks. It could even aid in aviator assignments and assessment of the effects changing flight hours has on the maintenance of flight skills.

Two development efforts currently underway would provide the means to accomplish these data needs. An aircraft Accident Information Retrieval System (AIRS) has advanced to the "brass board" stage at DARCOM's Applied Technology Laboratory, and ODCSOPS has let a contract for automation of the aviator's flight activity (record). However, it appears that automation of aviator flight activity records will be delayed for about eight years. Top level consideration and support are needed to expedite the development and procurement of these systems.

References

1. AR 95-1 Army Aviator: General Provisions and Flight Regulations Effective 1 Oct 78

2. AR 95-5 Aircraft Accident Prevention, Investigation, and Reporting Effective 1 April 1975

3. AR 385-40 Accident Reporting and Records Effective 1 July 1972

4. Headquarters, Department of Defense, Table for Computing Cost of Injuries and Occupational Illness of DOD Personnel, Department of Defense Instruction Nr. 1000.19 (Encl. 9), November 18, 1976.

5. Headquarters, Department of Defense, System Safety Program Requirements, Military Standard 882A, 28 June 1977.

6. US Army Safety Center, Analysis of FY 76 Army Aircraft Accidents that Involved Human Error, USAAAVS Report, 14 March 1977.

7. US Army Safety Center, Analysis of FY 77 Army Aircraft Accidents, USAAAVS Report, 3 January 1978.

8. Hicks, James E., "Engineering Analysis of Crash Injury in Army Aircraft," Paper presented at Aerospace Medical, AGARD/NATO, May 1978, Ft Rucker, Alabama.

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APPENDICES

APPENDIX A

LIST OF TEIR AND FIRE CATEGORIES

Task Error and Materiel Failure/Malfunction

0 Unknown
1 Inadequate flight planning: before or during mission (e.g., weather analysis, compatibility of crew equipment/aircraft with mission, flight plan, mission briefing)
2 Inadequate aircraft inspection: before or during mission (e.g., aircraft records, CG, preflight, thru-flight)
3 Inadequately performed required maintenance, maintenance inspection or maintenance records keeping
4 Inadequate crew coordination
5 Improperly divided attention
6 Inaccurately estimated clearance closure
7 Improper flight control action(s)
8 Misinterpreted in-flight failure/aircraft action
9 Improperly monitored instruments or performance of equipment
10 Improperly monitored performance of personnel
11 Improperly assigned personnel or equipment
12 Improperly managed work-rest cycle
13 Failed to provide required information: written procedures, flight information
14 Authorized a course of action that is prohibited by AR, FM, TM, SOP, directive, or common practice
15 Performed a course of action that is prohibited by AR, FM, TM, SOP, directive, or common practice
16 Improperly performed or failed to perform a course of action that is required by AR, FM, TM, SOP, directive, or common practice
17
18 Failed to maintain geographic orientation

COMPONENT THAT FAILED/MALFUNCTIONED:
19 Airframe (01): cockpit assembly
20 Airframe (01): fuselage assembly
21 Landing gear (02): wheels, skids
22 Landing gear (02): brakes
23 Power plant (03): engine + fuel control
24 Power plant (03): engine installation, shutoff valves, throttle linkage
25 Rotor transmission (04): main transmission + short shaft
26 Rotor transmission (04): main rotor system
27 Rotor transmission (04): tail rotor system
28 Rotor transmission (04): auxiliary gearboxes (42°, 90° and hanger bearings)
29 Propeller and propeller accessories (05)
30 Hydraulic system (06): flight controls
31 Hydraulic system (06): utility systems (landing gear, cargo hoist)
32 Pneumatic systems (07)
33 Aircraft instruments (08)
34 Electrical system (09): aircraft lighting
35 Electrical system (09): other (heater, fire detector)
36 Electrical system (09): battery, generator
37 Fuel system (10): fuel cells
38 Fuel system (10): piping and associated hardware
39 Flight control system (11)
40 Utility system (12)
41 Cargo and personnel equipment (17)
42 Avionics (19): communication
43 Avionics (19): navigation
44 Avionics (19): stabilization system
45 Armament (30)

System Inadequacy or Hazard

0 Unknown or insufficient information
1 Inadequate school training
2 Inadequate unit training
3 Inadequate experience

INADEQUATE PSYCHOPHYSIOLOGICAL STATE:
4 Composure
5 Attention
6 Judgment
7 Overconfidence in self
8 Overconfidence in others
9 Overconfidence in vehicle or equipment
10 Lacked confidence in vehicle or equipment
11 Lacked confidence in self
12 Motivation or mood: command pressure, excessive self-motivation, get-home-itis, peer pressure
13 Fatigue, illness, or effect of alcohol/drugs
14 Habit interference
15 Environmental influences: fog, smoke, haze, dust, sand, temperature, bird strikes, FOD
16 Equipment not available or improperly designed for required operation
17 Inadequate airfield or in-flight facilities services
18 Maintenance not performed or performed inadequately: inspection, installation, troubleshooting
19 Inadequate written procedures for operation in normal man-machine environmental conditions
20 Inadequate written procedures for operation in abnormal emergency man-machine-environmental conditions

INADEQUATE SUPERVISION/COORDINATION:
21 Higher command
22 Unit commander
23 Maintenance officer
24 Operations officer
25 Flight leader/platoon leader
26 IP or SIP
27 Pilot in charge of aircraft
28 Safety personnel
29 Weight & balance officer/technician
30 Manufacture, assembly, packaging, or quality control performed inadequately
31 Personnel utilized improper procedure
32 Personnel improperly utilized component or system

Remedial Measure

0 Unknown
1 Upgrade/provide school training
2 Upgrade/provide unit training
3 Revise/provide procedures for normal operation: AR, TM, FM, SOP, directive, reading file
4 Revise/provide procedures for abnormal/emergency operation: AR, TM, FM, SOP, directive, reading file
5 Insure personnel are ready/capable of performing job assigned regarding their training, experience, or psychophysiological state
6 Inform personnel of problems encountered and remedies via meetings, publications, EIRs, and directives/safety-of-flight messages
7 Positive command action to encourage proper performance and discourage improper performance
8 Provide proper personnel (numbers or qualifications) or reallocate the function to another duty position
9 Provide required vehicle/equipment or redesign existing vehicle/equipment
10 Provide required facilities and services or improve existing facilities and services

IMPROVE MONITORING OF PERSONNEL AND UNIT ACTIVITIES BY
11 Higher command
12 Unit commander
13 Maintenance officer
14 Operations officer
15 Flight leader or platoon leader
16 IP/SIP
17 Pilot in charge of aircraft

18 Perform studies/research to determine solution to system inadequacy
19 Improve quality control

NOTE: The above numbered categories were used by accident investigators as a guide and checklist. These numbers should also be used to interpret the category numbers in the simultaneous occurrence matrices of Appendices B-E.

Task Error and Materiel Failure/Malfunction

0 Unknown
1 Inadequate flight planning: before or during mission (e.g., weather analysis, compatibility of crew equipment aircraft with mission, flight plan, mission briefing)
2 Inadequate aircraft inspection: before or during mission (e.g., aircraft records, CG, preflight, thru-flight)
3 Inadequately performed required maintenance, maintenance inspection or maintenance records keeping
4 Inadequate crew coordination
5 Improperly divided attention
6 Inaccurately estimated clearance closure
7 Improper flight control action(s)
8 Misinterpreted in-flight failure aircraft action
9 Improperly monitored instruments or performance of equipment
10 Improperly monitored performance of personnel
11 Improperly assigned personnel or equipment
12 Improperly managed work-rest cycle
13 Failed to provide required information: written procedures, flight information
14 Authorized a course of action that is prohibited by AR, FM, TM, SOP, directive, or common practice
15 Performed a course of action that is prohibited by AR, FM, TM, SOP, directive, or common practice
16 Improperly performed or failed to perform a course of action that is required by AR, FM, TM, SOP, directive, or common practice
17
18 Failed to maintain geographic orientation

COMPONENT THAT FAILED MALFUNCTIONED

19 Airframe (01): cockpit assembly
20 Airframe (01): fuselage assembly
21 Landing gear (02): wheels, skids
22 Landing gear (02): brakes
23 Power plant (03): engine + fuel control
24 Power plant (03): engine installation, shutoff valves, throttle linkage
25 Rotor transmission (04): main transmission + short shaft
26 Rotor transmission (04): main rotor system
27 Rotor transmission (04): tail rotor system
28 Rotor transmission (04): auxiliary gearboxes (42°, 90° and hanger bearings)
29 Propeller and propeller accessories (05)
30 Hydraulic system (06): flight controls
31 Hydraulic system (06): utility systems (landing gear, cargo hoist)
32 Pneumatic systems (07)
33 Aircraft instruments (08)
34 Electrical system (09): aircraft lighting
35 Electrical system (09): other (heater, fire detector)
36 Electrical system (09): battery, generator
37 Fuel system (10): fuel cells
38 Fuel system (10): piping and associated hardware
39 Flight control system (11)
40 Utility system (12)
41 Cargo and personnel equipment (17)
42 Avionics (19): communication
43 Avionics (19): navigation
44 Avionics (19): stabilization system
45 Armament (30)

This list of human and materiel failure categories should be used in conjunction with appendix B.

APPENDIX B

DISTRIBUTION OF AIRCRAFT ACROSS TE/FM CATEGORIES: FY 78

Aircraft	001	003	005	006	007	008	009	010	011	013	014	015	016	021	023	025	026	027	029	030	033	035	038
AH-1	221 1			230 1		221 1							230 298 2		271 1								
OH-6					218 222 267 284 4		222 1	284 1				231 267 2	284 1		223 1								
OH-58	300 1	254 1	246 1		251 300 2	242 252 2				300 1	248 1	213 248 215 251 224 252 226 255 246 299 10	207 208 228₂ 233 254 6		212 249 254 273 4			287 299 2				233 1	235 1
TH-55								217 1															
UH-1	257 262₂ 263 4			234 264 291 292 4	244 272₂ 275 280 5		232 239 262 3	245 258 266 275 296 5	238 1	262 1		216 238₂ 241 257 281 6	225 266₂ 234 281 243 290 245 261₂ 10		236 247 262 3	276 1	280 1			277 1	262 1		
U-8														211 1									
OV-1				237 1											237 1				237 1				
T-42													256 1	220 1									
U-10					265 1																		
U-21											205 1		205 250₂ 3										
Total	6	1	1	6	12	3	4	7	1	2	2	18	23	2	10	1	1	2	1	1	1	1	1

Small numbers in cells refer to case numbers. Large number in cells refers to the number of occurrences.

System Inadequacy or Hazard

0 Unknown or insufficient information
1 Inadequate school training
2 Inadequate unit training
3 Inadequate experience

INADEQUATE PSYCHOPHYSIOLOGICAL STATE:
- 4 Composure
- 5 Attention
- 6 Judgment
- 7 Overconfidence in self
- 8 Overconfidence in others
- 9 Overconfidence in vehicle or equipment
- 10 Lacked confidence in vehicle or equipment
- 11 Lacked confidence in self
- 12 Motivation or mood: command pressure, excessive self-motivation, get-home-itis, peer pressure
- 13 Fatigue, illness, or effect of alcohol/drugs
- 14 Habit interference

15 Environmental influences: fog, smoke, haze, dust, sand, temperature, bird strikes, FOD
16 Equipment not available or improperly designed for required operation
17 Inadequate airfield or in-flight facilities services
18 Maintenance not performed or performed inadequately: inspection, installation, troubleshooting
19 Inadequate written procedures for operation in normal man-machine environmental conditions
20 Inadequate written procedures for operation in abnormal emergency man-machine-environmental conditions

INADEQUATE SUPERVISION/COORDINATION:
- 21 Higher command
- 22 Unit commander
- 23 Maintenance officer
- 24 Operations officer
- 25 Flight leader/platoon leader
- 26 IP or SIP
- 27 Pilot in charge of aircraft
- 28 Safety personnel

29 Weight & balance officer/technician
30 Manufacture, assembly, packaging, or quality control performed inadequately
31 Personnel utilized improper procedure
32 Personnel improperly utilized component or system

This list of inadequacy or hazard categories should be used in conjunction with appendix C.

APPENDIX C

DISTRIBUTION OF AIRCRAFT ACROSS SI OR HAZARD CATEGORIES: FY 78

System Inadequacy (SI)

Aircraft	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	29	30	Total
AH-1		221₃ 298 4			230 1	230 1										271 1												7
CH-6		218 1			218 222 2	231 267 284₂ 4		284 1				267₂ 2						223 1	222 1			267 1		267 1				14
CH-5B	299 1	207 246 2	254 1		208 242 251 252 4	215 251 224 252 226 255 228 299 248₂ 10	233 1		252 1	213 1	252 1	300₃ 3	215 300 2			207 212 233 235 273 287 299 7		249 254 2	212 254 228 299 251 252 6		215 254 2	251 1	215 1	246 1			254 1	48
TH-55								217 1																				1
UH-1		216 262₂ 232 272 238₂ 290 244 9	291 1	261 1	239 275 245 280 258 266 272 7	238 281 257₂ 291 263 266 7	280 1	234 296 2	257 1	290 1		234 238 2	257 280 2	243 245 261 275 4	292 1	236 262 280₂ 292 5	264 1		225 277₂ 241 262₄ 276 9		262 1	262 281 2			245 257 262 266 4	262 1	247 1	63
U-8																			211 1									1
OV-1						237 1												237₂ 2		237 1								4
T-42	256 1					256 1																					220 1	3
U-10			265 1																									1
U-21							250₂ 2												205₂ 2									4
Total	2	16	3	1	14	24	4	4	2	2	1	7	4	4	1	13	1	5	19	1	3	4	1	2	4	1	3	146

Small numbers in cells refer to case numbers. Large number in cells refers to number of occurrences.

Task Error and Materiel Failure/Malfunction

0 Unknown
1 Inadequate flight planning: before or during mission (e.g., weather analysis, compatibility of crew equipment/aircraft with mission, flight plan, mission briefing)
2 Inadequate aircraft inspection: before or during mission (e.g., aircraft records, CG, preflight, thru-flight)
3 Inadequately performed required maintenance, maintenance inspection or maintenance records keeping
4 Inadequate crew coordination
5 Improperly divided attention
6 Inaccurately estimated clearance/closure
7 Improper flight control action(s)
8 Misinterpreted in-flight failure/aircraft action
9 Improperly monitored instruments or performance of equipment
10 Improperly monitored performance of personnel
11 Improperly assigned personnel or equipment
12 Improperly managed work-rest cycle
13 Failed to provide required information: written procedures, flight information
14 Authorized a course of action that is prohibited by AR, FM, TM, SOP, directive, or common practice
15 Performed a course of action that is prohibited by AR, FM, TM, SOP, directive, or common practice
16 Improperly performed or failed to perform a course of action that is required by AR, FM, TM, SOP, directive, or common practice
17
18 Failed to maintain geographic orientation

COMPONENT THAT FAILED/MALFUNCTIONED:
19 Airframe (01): cockpit assembly
20 Airframe (01): fuselage assembly
21 Landing gear (02): wheels, skids
22 Landing gear (02): brakes
23 Power plant (03): engine + fuel control
24 Power plant (03): engine installation, shutoff valves, throttle linkage
25 Rotor transmission (04): main transmission + short shaft
26 Rotor transmission (04): main rotor system
27 Rotor transmission (04): tail rotor system
28 Rotor transmission (04): auxiliary gearboxes (42°, 90° and hanger bearings)
29 Propeller and propeller accessories (05)
30 Hydraulic system (06): flight controls
31 Hydraulic system (06): utility systems (landing gear, cargo hoist)
32 Pneumatic systems (07)
33 Aircraft instruments (08)
34 Electrical system (09): aircraft lighting
35 Electrical system (09): other (heater, fire detector)
36 Electrical system (09): battery, generator
37 Fuel system (10): fuel cells
38 Fuel system (10): piping and associated hardware
39 Flight control system (11)
40 Utility system (12)
41 Cargo and personnel equipment (17)
42 Avionics (19): communication
43 Avionics (19): navigation
44 Avionics (19): stabilization system
45 Armament (30)

System Inadequacy or Hazard

0 Unknown or insufficient information
1 Inadequate school training
2 Inadequate unit training
3 Inadequate experience

INADEQUATE PSYCHOPHYSIOLOGICAL STATE:
4 Composure
5 Attention
6 Judgment
7 Overconfidence in self
8 Overconfidence in others
9 Overconfidence in vehicle or equipment
10 Lacked confidence in vehicle or equipment
11 Lacked confidence in self
12 Motivation or mood: command pressure, excessive self-motivation, get-home-itis, peer pressure
13 Fatigue, illness, or effect of alcohol/drugs
14 Habit interference
15 Environmental influences: fog, smoke, haze, dust, sand, temperature, bird strikes, FOD
16 Equipment not available or improperly designed for required operation
17 Inadequate airfield or in-flight facilities/services
18 Maintenance not performed or performed inadequately: inspection, installation, troubleshooting
19 Inadequate written procedures for operation in normal man-machine environmental conditions
20 Inadequate written procedures for operation in abnormal/emergency man-machine-environmental conditions

INADEQUATE SUPERVISION/COORDINATION:
21 Higher command
22 Unit commander
23 Maintenance officer
24 Operations officer
25 Flight leader/platoon leader
26 IP or SIP
27 Pilot in charge of aircraft
28 Safety personnel
29 Weight & balance officer/technician
30 Manufacture, assembly, packaging, or quality control performed inadequately
31 Personnel utilized improper procedure
32 Personnel improperly utilized component or system

The above listing should be used in conjunction with appendix D.

APPENDIX D

DISTRIBUTION OF TASK ERRORS AND MATERIEL FAILURES/MALFUNCTIONS ACROSS SYSTEM INADEQUACIES OR HAZARDS: FY 78 ARMY-WIDE AIRCRAFT ACCIDENTS

TASK ERRORS AND MATERIEL FAILURES/MALFUNCTIONS

SYSTEM INADEQUACIES	1	3	5	6	7	8	9	10	11	13	14	15	16	21	23	25	26	27	29	30	33	35	38	TOTAL
1												299 1	256 1											2
2	221 262a 3		246 1		218 244 272 3	221a 2	232 1					216 238a 3	207 230 256 3											16
3		254 1		291 1	265 1																			3
4													261 1											1
5				290 1	218 280 251 272 4	242 252 2	222 239 2	245 275 258 266 4					208 1											14
6	257 263 2			237 291 2	267 284 2			284 2	238 1		248 1	215 231 252 281 224 248 255 289 236 251 257 11	228 266 230 256 4											26
7					280 1								233 250a 3											4
8								217 286 2					254 284 2											4
9												252 257 2												2
10												213 1	290 1											2
11												252 1												1
12	300 1			234 1	300 1				238 1	300 1		267a 2												7
13	257 1				280 300 2							215 1												4
14					275 1			245 1					243 261 2											4
15				292 1																				1
16				292 1	280 1		262 1						207 1		212 273 236 271 4		280 1	287 299 2				233 1	235 1	13
17				264 1																				1
18															223 254 237 249 4				237 1					5
19	262a 2				222 1	252 1					205 1	241 251 299 3	205 254 225 228 4	211 1	212 262 2	276 1				277a 2	262 1			19
20				237 1																				1
21		254 1								262 1		215 1												3
22	262 1											251 267 2	281 1											4
24												215 1												1
25												246 267 2												2
26	257 262 2												245 266 2											4
29	262 1																							1
30														220 1	247 254 2									3
Total	13	2	1	9	17	5	4	8	2	2	2	31	26	2	12	1	1	2	1	2	1	1	1	146

Small numbers in cells refer to case numbers. Large number in cells refers to the number of occurrences.

System Inadequacy or Hazard

0 Unknown or insufficient information
1 Inadequate school training
2 Inadequate unit training
3 Inadequate experience

INADEQUATE PSYCHOPHYSIOLOGICAL STATE:
- 4 Composure
- 5 Attention
- 6 Judgment
- 7 Overconfidence in self
- 8 Overconfidence in others
- 9 Overconfidence in vehicle or equipment
- 10 Lacked confidence in vehicle or equipment
- 11 Lacked confidence in self
- 12 Motivation or mood: command pressure, excessive self-motivation, get-home-itis, peer pressure
- 13 Fatigue, illness, or effect of alcohol/drugs
- 14 Habit interference

15 Environmental influences: fog, smoke, haze, dust, sand, temperature, bird strikes, FOD
16 Equipment not available or improperly designed for required operation
17 Inadequate airfield or in-flight facilities services
18 Maintenance not performed or performed inadequately: inspection, installation, troubleshooting
19 Inadequate written procedures for operation in normal man-machine environmental conditions
20 Inadequate written procedures for operation in abnormal emergency man-machine-environmental conditions

INADEQUATE SUPERVISION COORDINATION:
- 21 Higher command
- 22 Unit commander
- 23 Maintenance officer
- 24 Operations officer
- 25 Flight leader platoon leader
- 26 IP or SIP
- 27 Pilot in charge of aircraft
- 28 Safety personnel

29 Weight & balance officer technician
30 Manufacture, assembly, packaging, or quality control performed inadequately
31 Personnel utilized improper procedure
32 Personnel improperly utilized component or system

Remedial Measure

0 Unknown
1 Upgrade/provide school training
2 Upgrade/provide unit training
3 Revise/provide procedures for normal operation: AR, TM, FM, SOP, directive, reading file
4 Revise/provide procedures for abnormal/emergency operation: AR, TM, FM, SOP, directive, reading file
5 Insure personnel are ready/capable of performing job assigned regarding their training, experience, or psychophysiological state
6 Inform personnel of problems encountered and remedies via meetings, publications, EIRs, and directives/safety-of-flight messages
7 Positive command action to encourage proper performance and discourage improper performance
8 Provide proper personnel (numbers or qualifications) or reallocate the function to another duty position
9 Provide required vehicle/equipment or redesign existing vehicle/equipment
10 Provide required facilities and services or improve existing facilities and services

IMPROVE MONITORING OF PERSONNEL AND UNIT ACTIVITIES BY:
- 11 Higher command
- 12 Unit commander
- 13 Maintenance officer
- 14 Operations officer
- 15 Flight leader or platoon leader
- 16 IP/SIP
- 17 Pilot in charge of aircraft

18 Perform studies, research to determine solution to system inadequacy
19 Improve quality control

The above listing should be used in conjunction with appendix E.

APPENDIX E

DISTRIBUTION OF REMEDIAL MEASURES ACROSS SYSTEM INADEQUACIES OR HAZARDS: FY 78 ARMY-WIDE AIRCRAFT ACCIDENTS

SYSTEM INADEQUACIES

REMEDIAL MEASURES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	29	30	TOTAL
1	256 299 2				245 1							300 1																4
2		207 216 221₃ 232 238₂ 244 246 262₂ 272 290 298 15			218 230 251 3	230 237 257 267 281 284 6				290 1				243 275 2										246 1				28
3		272 298 2				224 1		284 1				300 1	300₂ 2	243 1					205₂ 241₂ 277₂ 211 251 299 212 252 222 254 225 262₂ 228 276 19			262 1				262 1	247 254 2	31
4																				237 1								1
5		218 1	265 1	261 1		238 291 256 259 4	280 1			213 1		267 1		261 1								267 1						12
6	299 1	238 1			222 272₂ 239 242₂ 252 258 266 9	215 256₂ 228 257₂ 237 266 248 284₂ 251 291 252 299 15	233 1	217₂ 234 284 296 5	252 257 2	213 1	252 1	300₂ 2	215₂ 2	261 1		299 1		237 249 2	262 299 2					245 266 2				48
7					266 275 2	228 255 231 263 248₄ 286 9	250₂ 2					300 1									215 1	261 1			266 1				17
8		207 1																			254 1				257 1			3
9					208 1										292 1	207 212 233 235 236 280₂ 282 287 271 292 273 12			277 1									15
10													257 1				264 1											2
11		238 246 2										238 1						223 237₂ 3	276 1		262 1	262 1	215 1		262 1		220₂ 247 3	14
12		218 1	254 291 2		280 1	257₂ 284 3			257 1			234 1	280 1	261 1				254 1				251 1		246 1		262 1		15
13																		249 1										1
15												267 1												267 1				2
16					245 1									245 1											245 1			3
18		298 1								290 1		300 1				299 1			282 276 2									6
19																		249 1										1
Total	3	24	3	1	18	38	4	6	3	4	1	10	6	7	1	14	1	8	25	1	3	5	1	3	6	2	5	203

Small numbers in cells refer to case numbers. Large number in cells refers to the number of occurrences.

APPENDIX F

METHOD

Data Source

The data used for this report was obtained by a review/analysis of all Army aircraft accidents that occurred in FY 78. As summarized in Table 1, a total of 69 accidents could be analyzed according to the requirements of the 3W method. Twenty-one accident reports contained insufficient information to perform the required analysis, i.e., investigators could not identify definite failures or failure "causes" for man or machine. Also shown in the table are the associated dollar costs (personnel injury + aircraft damage = property damage).

TABLE 1.--FY 78 Army Aircraft Accidents

	Number	Cost
Accidents analyzed in this report	69	$19,191,478
Accidents which had insufficient information to perform analysis	21	$12,335,987
Total FY 78 accidents	90	$31,527,465

Individual Analysis

These 69 aircraft accidents were individually analyzed by accident investigation using the 3W approach. This approach is based on a conceptual framework adapted from a model by Ricketson, 1975. Figure 1 presents a model of the human-error accident. The premise of this model is that when one or more of the 12 basic elements of the aviation system do not operate as intended, an overload (item 13) is placed on the man's role in the system (item 14). That is, the man must continue to perform normal tasks while correcting for the abnormal system condition. If the overload is of such magnitude or persistence that the man cannot cope with it and continue to perform normal tasks, he begins to make errors (item 15). Most of these errors do not result in an accident (item 16). But, as the magnitude and frequency of errors increase, the likelihood of the error causing an accident increases. When an accident occurs that has been caused by a human error(s), it is probable that this error has occurred many times before the accident happened and is likely to continue to occur unless some remedial action is taken.

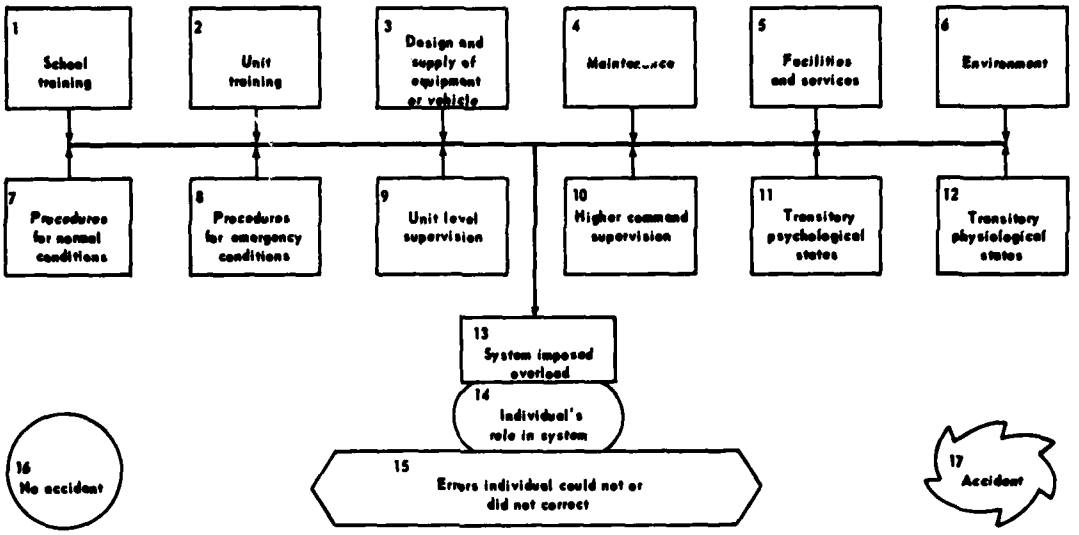

FIGURE 1.–Model of Human Error Accident

This basic model was used to develop the approach outlined in table 2. The approach requires the accident investigation board to identify what happened, what caused or allowed it to happen, and what to do about it (3W) with respect to man as a cause factor, the machine as a cause factor, and the environment as a cause factor. This report only addresses the man and machine cause factors.

TABLE 2.--3W Approach to the Investigation, Analysis, and Prevention of Accidents

Accident Cause	What Happened	What Caused It	What to Do About It	Acronym
Man	Task Error	System Inadequacies	Remedial Measures	TEIR
Machine	Failure or Malfunction	System Inadequacies	Remedial Measures	FIRE

Human Error. *The acronym for the 3W approach to the investigation,* analysis, and prevention of human-error accidents is TEIR. The elements of TEIR are defined as follows:

1. A task error (TE) is job performance which deviated from that required by the operational situation and caused or contributed to an accident. Required performance includes that stipulated by (a) school training, (b) on-the-job training, (c) U.S. Army

regulations and guidelines, (d) standing operating procedures, or (e) commonly accepted practices. An error is assigned only when it is judged that a person of normal or reasonable competence could have performed the task correctly in the existing operational situation.

2. A system inadequacy (I) or hazard is an element of the aviation system that did not operate as intended or designed. An I is assigned only when it is judged to have caused, allowed, or contributed to the occurrence of a TE. More than one I may be assigned to a given TE.

3. A remedial measure (R) is an action required to correct or at least reduce the operational impact of an I. The R may be directed at any command level for implementation and is not to be restricted by current technology or budgetary, personnel and equipment resources. More than one R may be recommended for a given I.

Materiel Failure. The 3W approach relating to materiel failure/malfunctions is also based on the conceptual framework adapted from Ricketson's (1975) model. Figure 2 presents a model of the materiel failure/malfunction accident.

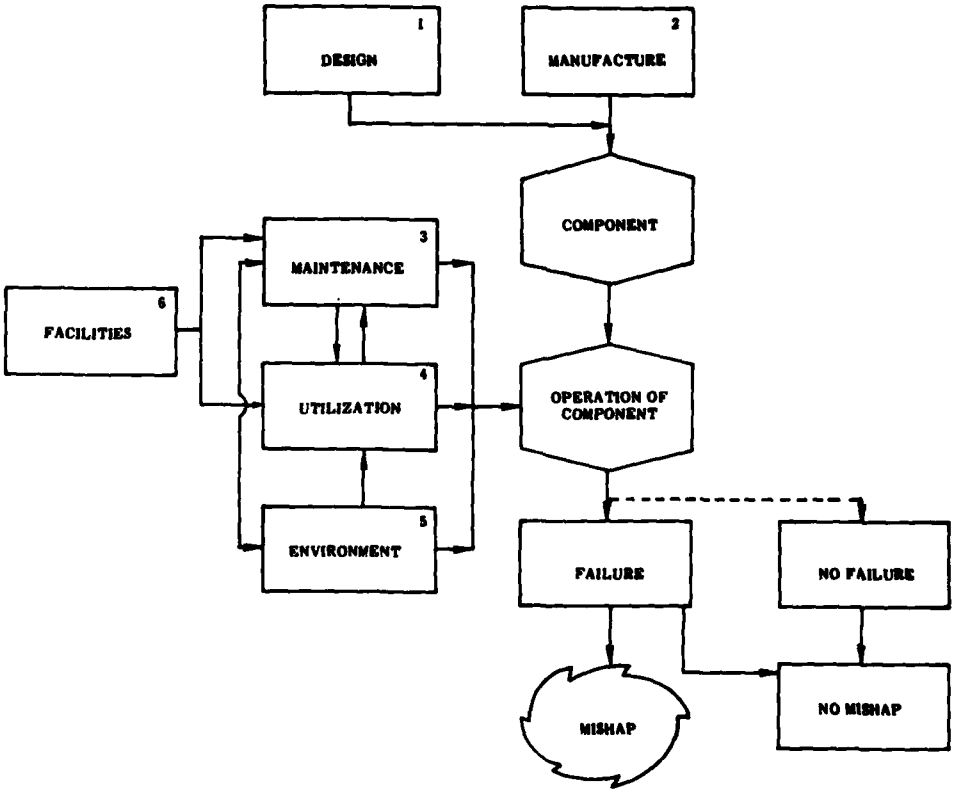

FIGURE 2.–3W Model of Mishap Caused by Materiel Failure/Malfunction

The acronym for the 3W approach to the investigation, analysis, and prevention of mishaps caused by materiel failure/malfunction is FIRE. The elements of FIRE are defined as follows:

(1) A materiel failure/malfunction (F) is a component or system that (a) ceases to operate entirely, (b) operates, but not as designed or intended, (c) operates as designed, however, operational needs require enhanced performance. A materiel failure/malfunction is considered for analysis only when it is judged to have caused or contributed to the mishap, not resulted from the mishap.

(2) A system inadequacy (I) is an element of the aviation system that did not operate as intended or designed. An I is assigned only when it is judged to have caused, allowed, or contributed to the occurrence of an F. More than one I may be assigned to a given F.

(3) A remedial measure (RE) is an action required to correct or at least reduce the operational impact of an I. The RE may be directed at any command level for implementation and is not to be restricted by current technology or budgetary, personnel, and equipment resources. More than one RE may be recommended for a given I.

Individual Accident Analysis. Figure 3 shows the general process by which the individual analysis of an accident was accomplished.

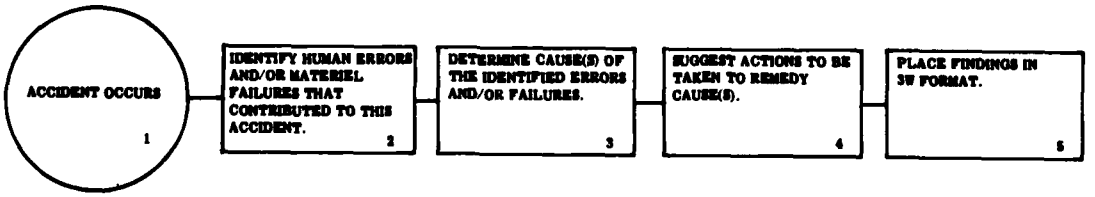

FIGURE 3.–Identification of Hazards in Each Individual Accident

1. Accident Occurrence.

Once an aircraft mishap occurred, the mishap classification was determined IAW procedures outlined in AR 385-40, Accident Reporting and Records. This AR lists five principal aircraft mishap classifications: (1) major accident; (2) minor accident; (3) incident; (4) forced landing; and (5) precautionary landing. This report will include only

those mishaps falling into the "major" and "minor" accident categories. For further definition, the "major" accident classification was divided into two groups--"major total" and "major substantial." The "major total" classification refers to those "major" accidents in which the aircraft was damaged to the extent that repair would not be feasible. The "major substantial" (usually referred to as "major" only) classification refers to those "major" accidents in which a substantial amount of damage was done.

2. Identify Human Errors and/or Materiel Failures.

The first step in the identification of hazards in each accident was to determine what happened, e.g., what human errors and/or materiel failures/malfunctions occurred that contributed to THIS accident. This was done using the concepts and procedures outlined in AR 95-5, chapter 11. According to these procedures, all duty positions and all hardware systems would be investigated to determine if any contributed to the accident. Only those failures (human errors and materiel failure/ malfunctions) that directly contributed to the accident were considered for this report.

Accident investigation and reporting are usually divided into two major phases: precrash, which includes everything up to and including the accident sequence; and postcrash, e.g., the survival and rescue phase. Only those human errors and materiel failures/malfunctions that caused/allowed/contributed to the precrash phase of the accident were considered for this report. The definitions of these human and materiel failures were previously given.

3. Determine Cause(s) of Identified Errors and/or Failures.

When the human errors and/or materiel failures/malfunctions had been identified, the next step was to determine what problem within the aviation system (Refer to models in Figures 1 and 2) caused or allowed the error or failure. Often it is possible to identify what happened (error that was made or part that failed) but not what caused it. This lack of information can be attributed to several things: (1) catastrophic accident in which all occupants were killed and physical evidence (aircraft) was destroyed; (2) human error took place by person who could not be identified, e.g., maintenance personnel at either unit or overhaul facility incorrectly routed hydraulic line; (3) cause of component failure could not be determined by teardown analysis facility; (4) board could not identify any definite human error or materiel failures.

4. Suggest Remedial Measures.

Once the failure and/or error had been identified and the problem within the system that caused or allowed it had been determined, the next step was to suggest action to be taken to remedy the system problem. This remedy can be aimed at any level of command as it is not bound by current manpower, budget, or state-of-art limitations. Also, more than one remedy may be needed to solve the problem or reduce its effect on operations.

5. Place Individual Findings into 3W Format.

Category numbers (see appendix A) were assigned to each contributing error or failure, its cause(s) and associated remedial measure(s). This procedure requires that all the basic information concerning each accident be coded into a form that lends itself to computerization. These basic elements include type aircraft, duty position, accident classification, materiel costs, injury costs, etc.

Collective Analysis. Figure 4 shows the process by which the overall analysis was accomplished.

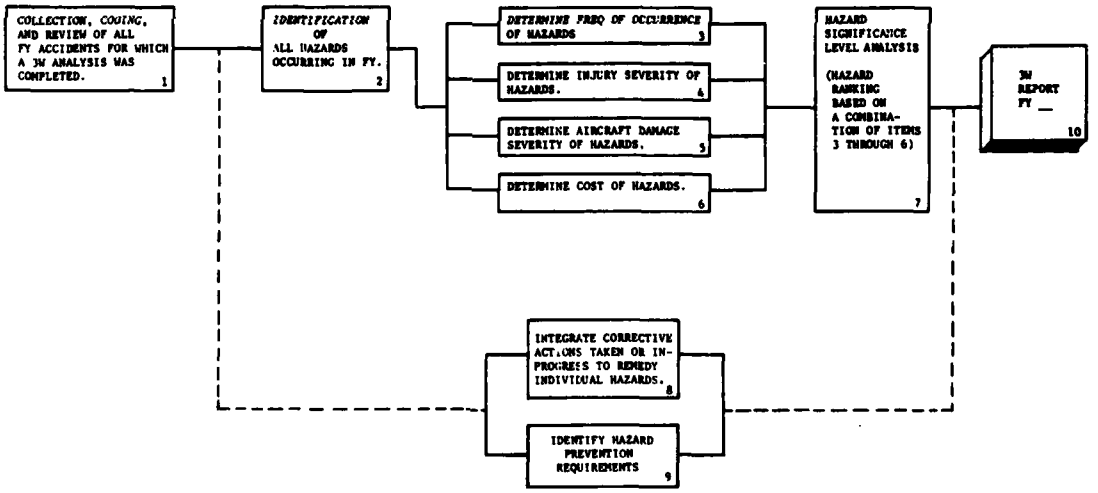

FIGURE 4.–Sequence of Overall Analysis

1. Collection, Coding and Review.

When each individual accident had been reviewed and a 3W analysis completed for those containing sufficient information, they were collated for a collective analysis.

2. Hazard Identification.

All hazards that occurred in FY 78 are identified in table 3. These were identified by system inadequacy or hazard category (appendix A) and presented by frequency of occurrence. Any problem that occurred once based on the philosophy of the model at figure 1 has a likelihood of occurring again. For this reason, each hazard that occurred is presented.

3-6. Elements Used for Determing Hazard Significance Level.

a. Ranking According to Frequency.

Each hazard category was evaluated based on its frequency of occurrence and placed in the appropriate frequency index shown in table 3. The format and rationale for this frequency ranking procedure was modeled after reference 5.

TABLE 3.–System Hazard Frequency Ranking

FREQUENCY INDEX	DESCRIPTIVE NOMENCLATURE	MATHEMATICAL DEFINITION
A	Frequent	$0.2<f^*$
B	Reasonably frequent	$0.1<f\leq 0.2$
C	Occasional	$.05<f\leq 0.1$
D	Remote	$.01<f\leq .05$
E	Improbable	$f\leq .01$

*f is defined as the relative frequency of hazard occurrence.

$$f = \frac{\text{Frequency of occurrence of hazard}}{\text{Number of man/machine failures}}$$

b. Ranking According to Injury Severity.

Each system hazard was evaluated relative to the severity of the injuries associated with it. This evaluation placed each system hazard

into one of the injury severity ranks shown in table 4. The rationale and format for this ranking procedure was taken from reference 5.

TABLE 4.–Injury Severity Ranking

SEVERITY INDEX	DESCRIPTIVE NOMENCLATURE	DEFINITION
I	Life-threatening	Results* in fatal injury
II	Serious	Results in disabling injury
III	Marginal	Results in nondisabling injury
IV	Negligible	No injury

*Worst credible result

The injury definitions are based on guidelines in DODI 1000.19.

c. Determine Aircraft Damage Severity.

Each system hazard was evaluated relative to the severity of aircraft damage associated with it. This evaluation placed each hazard into one of the ranks shown in table 5.

TABLE 5.–Aircraft Damage Severity Ranking

SEVERITY INDEX	DESCRIPTIVE NOMENCLATURE	DEFINITION
a	Total	Results in total loss* damage
b	Major	Results in major damage
c	Minor	Results in minor damage

*Aircraft damage classifications are based on procedures and criteria described in Army Regulation 385-40.

d. Determine cost of hazards.

Each of the system hazards was evaluated relative to the costs associated with it. This cost is the sum of aircraft damage, injury, and property damage costs. These costs were proportioned by:

$$\text{System Hazard Cost} = \frac{\text{Total Cost of Accident}}{\begin{array}{l}\text{Number of Hazards}\\ \text{(System inadequacies)}\\ \text{Identified in the Accident}\end{array}}$$

For Example

Case #215 System Hazard Cost = $\frac{\$93460}{4}$

System Hazard Cost = $23365

The method used to arrive at the dollar cost associated with each hazard category involved the addition of all dollar costs of the cases in which a particular hazard was a factor. This approach assigns the same dollar cost weight to each hazard identified in the accident. No attempt was made to apply differential weights to the hazards (cause factors).

7. Overall Ranking of Hazards (HSL Analysis).

The results of evaluating each hazard according to its frequency and severity (as described above) were used to place the hazards into overall significance groups. Frequency and severity rankings of each hazard were weighted equally in this process. Table 6 indicates how all hazards were placed into one of ten groups as determined by the combination of frequency and severity indices.

TABLE 6.–Hazard Significance Groups Based on Frequency, Aircraft Damage, Injury Severity, and Cost

Significance Group	Index	Significance Group
1	AIa	1
2	AIIa, AIb, BIa	2
3	AIIIa, AIIb, AIc, BIIa, BIb, CIa	3
4	AIVa, AIIIb, AIIc, BIIIa, BIIb, BIc, CIIa, CIb, DIa	4
5	AIVb, AIIIc, BIVa, BIIIb, BIIc, CIIIa, CIIb, CIc, DIIa, DIb, EIa	5
6	AIVc, BIVb, BIIIc, CIVa, CIIIb, *CIIc*, *DIIIa*, *DIIb*, *DIc*, *EIIa*, *EIb*	6
7	BIVc, CIVb, CIIIc, DIVa, DIIIb, DIIc, EIIIa, EIIb, EIc	7
8	CIVc, DIVb, DIIIc, EIVa, EIIIb, EIIc	8
9	DIVc, EIVb, EIIIc	9
10	EIVc	10

The hazards within each group were then rank-ordered according to accident costs. As a result, the ordered list comprises a "totem pole" of aviation hazards.

8. Integrate Corrective Actions Taken or In Progress to Remedy Individual Hazards.

At this point, only the hazard identification stage had been completed. The next step involved the identification of prevention actions for hazards on a case by case basis. These prevention actions were obtained from USASC managers for each type aircraft and were integrated with the TEIR and FIRE narrative for each accident case in appendix G.

9. Identify Hazard Prevention Requirement.

The final step (item 10) was to analyze the collective nature of the FY 78 aviation hazards and to identify the most pressing prevention requirements. The identification of prevention requirements was based on the HSL analysis and the judgment of human factors specialists and the aircraft system managers at USASC. The results are reported in table 3 of the report. This process allows for the incorporation of prevention requirements based on more than statistics alone. It allows for the incorporation of specialty expertise not always available to accident investigators, as well as for knowledge of hazards that transcends that found in an accident report, i.e., state-of-the-art prevention capabilities.

APPENDIX G

3W NARRATIVES AND REMEDIAL ACTIONS TAKEN OR IN PROGRESS FOR FY 78 ARMY AIRCRAFT ACCIDENTS

CASE #205

1. USASC briefings to external elements include fixed wing statistics relating fixed wing accident data with IP's on board.

2. FLIGHTFAX article (Vol. 7, No. 7, 15 Nov 78), subject: "A Time for Action," publicizes the IP-related accidents and points out deficiencies in IP training, qualifications, and responsibilities (applies to all FW accidents).

3. FLIGHTFAX article (Vol. 6, No. 5, 2 Nov 77), fixed wing mishap briefs, discussed events of this mishap.

LIST OF 3W NARRATIVES OF FY78 ARMY AIRCRAFT ACCIDENTS

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
205		No contributing materiel failure/ malfunction.		
205	IP	14 U-21A IP conducting transition training authorized a course of action prohibited by TM 55-1510-209-10, paragraph 9-5b(4). On takeoff, at approximately 150 feet AGL and 110 KIAS, IP initiated a simulated engine failure. When RSP unexpectedly retarded power on the remaining engine in order to land, IP permitted RSP to proceed with this course of action instead of continuing flight as required after reaching minimum single-engine climb speed for takeoff (97 KIAS). As a result, when IP realized the gear was still retracted, time was too short to prevent a gear-up landing.	19 U-21A IP authorized a prohibited course of action (permitted RSP to land instead of continuing single-engine flight during simulated engine failure on takeoff) because of inadequate written procedures. Although RSP's decision to land was unexpected, IP considered it a proper course of action because the U-21 IP Qualification Flight Training Guide, paragraph 31c(1) and the U-21 Pilot Flight Training Guide, paragraph 24c(1) indicate a landing may be made if sufficient runway remains. However, AR 95-63, paragraph 1-13 establishes each aircraft's operator's manual as the primary reference governing operation of that aircraft and TM 55-1510-209-10, paragraph 9-5b(4) prescribes that after becoming airborne and attaining 97 KIAS, single engine flight should be continued.	3 TRADOC should revise the U-21 Pilot and IP Flight Training Guides to be consistent with TM 55-1510-209-10 concerning single-engine procedures on takeoff. (TRADOC should make the same revision to the Utility Airplane Aircrew Training Manual (TC 1-145), Appendix B, Task 1017, page 80).

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
205	RSP	16 U-21A rated student pilot (RSP) on a unit transition training flight failed to perform a course of action required by TM 55-1510-209-10, paragraph 9-5b(4). On takeoff, at approximately 150 ft. AGL and 110 KIAS, IP initiated a simulated engine failure. RSP responded by retarding power on remaining engine in order to land instead of continuing flight as required after reaching minimum single engine climb speed for takeoff (97 KIAS). As a result of his quick but incorrect decision to land, RSP forgot to lower the landing gear and the aircraft landed gear-up.	19 U-21A RSP failed to perform a required course of action (decided to land instead of continuing single-engine flight during simulated engine failure on takeoff) because of inadequate written procedures. RSP considered landing a proper course of action because the U-21 IP Qualification Flight Training Guide, paragraph 31c(1) and the U-21 Pilot Flight Training Guide, paragraph 24c(1) indicate a landing may be made if sufficient runway remains. However, AR 95-63, paragraph 1-13 establishes each aircraft's operator's manual as the primary reference governing operation of that aircraft and TM 55-1510-209-10, paragraph 9-5b(4) prescribes that after becoming airborne and attaining 97 KIAS single engine flight should be continued.	3 TRADOC should revise the U-21 Pilot and IP Flight Training Guides to be consistent with TM 55-1510-209-10 concerning single-engine procedures on takeoff. (TRADOC should make the same revision to the Utility Airplane Aircrew Training Manual (TC 1-145), Appendix B, Task 1017, page 80).
207		No contributing materiel failure/ malfunction.		

CASE #207

Actions In Progress

1. An adjustable landing light is one of the improvements being incorporated in the OH-58C model.

2. At the OH-58 User Conference held at Fort Rucker on 15-16 January 1979, the "users" indicated that an adjustable landing light was required on the OH-58A. Product improvement action is underway to implement the requirement.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
207	P	16 OH-58A pilot observing and adjusting the rocket firing of an AH-1 during night qualification failed to perform a course of action that is required by TC 1-28, para 5-28. He failed to use the landing light to determine the suitability of an area as a precautionary landing site. Upon illumination of the engine chip detector light, pilot commenced a steep approach to an area he considered open and clear. At 8-10 feet, the tail rotor struck branches of an obscured charred tree. Aircraft continued to the ground in a tail low attitude and sustained major damage upon impact.	16 OH-58A pilot failed to perform a course of action as required by TC 1-28 (did not use the landing light to verify suitability of an area as precautionary landing site) because required equipment is improperly designed. Landing light should have been used to verify that selected precautionary landing site was clear of obstructions, i.e., charred tree and obstructions to vision. The light was not used because the pilot considered the accompanying glare as unacceptable when close to the ground.	9 DARCOM should redesign existing equipment to reduce glare from OH-58A fixed landing light when illumination of a night landing area is required. (Note: The OH-58C helicopter will incorporate a moveable landing light. Production modification will accomodate those subsequent to the first 50. A field modification kit will change the first 50. At this time the OH-58A will not be modified.)
207	P	16 (Repeat)	2 OH-58A pilot failed to perform a course of action as required by TC 1-28 (did not use the landing light to verify the suitability of an area as a precautionary landing site) because of inadequate unit training. Pilot had not received sufficient training in the execution of emergency procedures at night due to the unit being without an OH-58 IP for approximately three months, and involvement with Army test which precluded maintaining night flying proficiency IAW unit policy (two hours of night flying every 14 days).	2 Unit commander upgrade unit training to maintain aviator's night flying proficiency by complying with unit policy of two hours night flying in each 14 days.

CASE #208

Actions Completed

1. MWO 55-1520-228-30-30, issued 31 May 1978, requires that a caution stencil be applied on the rear of the front seats. This cautions the passenger that the seat belt must be fastened and the door closed on exiting.

2. Change 1 to the OH-58A Operator's Manual, TM 55-1520-228-10, provides a warning to the pilot which requires him to demonstrate to passengers how seat belts and shoulder harnesses are to be used and how they are secured when exiting.

3. FLIGHT FAX article (Vol. 6, No. 19) entitled "$5000.00 Seat Belt" was published on 1 March 1978. The article emphasizes use of the checklist.

Actions In Progress

1. EIR (Control Number 984672) submitted by unit recommending that retractable-type seat belts be adopted for use by passengers. One retractable-type seat belt has been evaluated but did not meet specifications.

2. A suggestion (FR-5-78) from the field to utilize elastic shock cords to secure the outboard ends of the seat belts is being evaluated.

3. TSARCOM is evaluating an aluminum bash plate which would provide protection to the honey-comb paneling if a passenger seat belt was left hanging outside the aircraft.

CASE #211

Actions Completed

1. TM 55-1510-201-PMS was revised 15 Sep 78 to require the magneflux inspection of the nose gear drag brace assembly every 300 horus.

2. FLIGHTFAX article (Vol. 6, No. 5, 2 Nov 77), fixed wing mishap briefs, discussed events of this mishap.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
207	P	16 (Repeat)	2 (Repeat)	8 Higher command provide proper personnel (numbers and qualification) to assist unit command to upgrade unit training by insuring that unit has an OH-58A IP who can provide sufficient training in the execution of night emergency procedures.
208	P	No contributing materiel failure/ malfunction.		
208	P	16 OH-58A pilot on a service mission to pick up aircraft parts failed to perform a course of action that is required by TM 55-1520 228-CL, page N-8. During the "Before Takeoff" check, the pilot failed to complete item eight, "Passenger's Seat Belt - Inside of Aircraft and Fastened." As a result, the right passenger seat belt was left outside the aircraft during a 25-minute flight. The seat belt flailed against the right side of the aircraft causing major damage.	5 OH-58A pilot failed to perform a required course of action (fasten passenger seat belts inside of aircraft) because of inadequate attention. The pilot stated he, "Looked back to check the seat belts and thought (he) saw the complete set." Since the right seat belt was not inside the aircraft, the pilot obviously did not devote enough attention to performing this check.	9 DARCOM (TSARCOM) provide required equipment. A possible solution would be retractable type seat belts for use by passengers in the OH-58A. Retractable type seat belts would eliminate the requirements for pilots to perform the seat belt check. Pilots are prone to attention problems during this check because it is difficult to see the rear seat belts.
211		21 U-8F on day service mission experienced a landing gear malfunction. During attempted gear retraction after takeoff at 400 feet AGL and 120 KIAS, the nose gear drag brace (PN 50-820009-8) broke preventing the nose gear from moving from a position approximately halfway retracted. After trouble shooting the problem the crew elected to make a gear-up landing which resulted in minor aircraft damage.	19 U-8F experienced a landing gear malfunction (nose gear drag brace failure) because written maintenance procedures are inadequate. The nose gear drag brace (PN 50-820009-8) failed from fatigue mechanisms which were allowed to progress to the failure point because the required 600-hour magnaflux inspection interval in TM 55-1510-201 PMS is excessive. This component failed approx. 460 hours after the last scheduled inspection.	3 DARCOM revise TM 55-1520-201-PMS to include the requirement for a reduced interval magnaflux inspection of the nose gear drag brace assembly. An interval of 300 hours is recommended. This increased rate of inspection should detect progressive fatigue and prevent it from progressing to the failure point.

CASE #212

Actions Completed

1. TSARCOM message 272115Z Jan 78 outlined the program to train maintenance personnel to inspect the coupling nut.

2. TSARCOM SOF message 78-1 (102315Z Feb 78) provided power turbine coupling nut inspection procedures.

3. TSARCOM SOF message 78-2 (021935Z Mar 78) reduced the engine inspection criteria. All engines were to be inspected within 25 flight hours or 30 days and reinspected every 90 days.

4. TB 55-1500-200-20-20, Inspection of T63-A-700 and T63-A-5A Power Turbine Outer Coupling Nut (OH-6 and OH-58), was issued on 15 Mar 78.

Actions In Progress

A 90-day inspection of the coupling nut (PN 6846278) is required until it has been replaced by the improved nut (PN 6890531). TM 55-2840-231-24 provides inspection requirements.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
211		No contributing human error.		
212		23 OH-58A hovering on a day maintenance test flight experienced an engine failure. The T63A700 engine (PN 6874201) exploded throwing shrapnel that caused damage to the main rotor, tail rotor drive shaft, and resulted in a small oil fire. The aircraft was autorotated from a hover and the fire was extinguished by the crew.	19 OH-58A experienced an engine failure when the power turbine shaft outer coupling nut (PN 6846278) failed from corrosion (rust) which was allowed to progress to failure because of inadequate written maintenance procedures. The nut failed allowing the third stage power turbine rotor to become loose on the turbine shaft which in turn caused an out-of-balance condition and catastrophic overstress failure of the turbine rotor. The engine had been operating 52 months since overhaul with only 590 flight hours. No inspection of this area is required at unit level.	3 DARCOM provide procedures for calendar type inspection of the power turbine shaft outer coupling nut. This requirement can be implemented by issuing a Technical Bulletin outlining inspection requirements.
212		23 (Repeat)	16 OH-58A experienced an engine failure when the power turbine shaft outer coupling nut (PN 6846278) failed because of inadequate design. The nut was made of metal which was susceptible to corrosion (rust). This corrosion progressed to failure of the nut and resulted in catastrophic failure of the turbine rotor.	9 DARCOM initiate action to redesign the power turbine shaft outer coupling nut (PN 6846278) and specify the nut contain non-corrosive or corrosive resistant material. The corrosion resistant nut should be installed at overhaul on next major inspection to reduce the possibility of a corrosion induced failure.

CASE #213

Actions Completed

1. USAAAVS recommended to USAAVNC that the hazards involved in low G flight be addressed in the initial aerodynamics block of instruction. Also, that instruction in low G hazards, as it applies to specific aircraft, be presented in all aircraft qualification and IP courses.

2. USAAAVS recommended a change that reduces the inspection time for the pylon isolation mount. The change should be incorporated in TM 55-1520-228-23-1, Aviation Unit and Intermediate Maintenance Manual, dated 4 August 1978, in the near future.

CASE #214

Actions Completed

1. ATM now prohibits this type of takeoff. Power/prop adjustments are not accomplished until 500 feet of altitude is obtained.

2. USASC/TSARCOM implemented action to eliminate the nude engine concept for U-8F effectivel Apr 79. Under this concept engines will now be issued with magnetos, wiring harnesses, etc. U-8D/G fleet to be retired by 1 Oct 79.

3. FLIGHTFAX article (Vol. 6, No. 8, 23 Nov 77), fixed wing mishap briefs, discussed events of this mishap.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
212		No contributing human error		
213		No contributing materiel failure/ malfunction.		
213	MTP	15 OH-58A maintenance test pilot, while performing a maintenance test flight, performed a course of action prohibited by TM 55-1520-228-10, para 4-36.1. When main transmission chip detector light illuminated and pilot encountered vibrations, he entered autorotation instead of performing a normal landing at the nearest safe landing area. During the autorotation aircraft struck power lines and pilot landed aircraft within next 500 ft. with minor damage.	10 OH-58A MTP performed a prohibited course of action (entered autorotation instead of performing normal landing to nearest safe landing area) because he lacked confidence in the OH-58A aircraft. MTP admitted that he lacked confidence in the durability of the aircraft flight control system (stated, "I have always hated flying the OH-58A after flying the OH-6A") after having read many times of the "failure of the dog legs."	5 Unit Commander (Operations Officer) insure personnel are ready/capable of performing job assigned regarding their psychophysiological state. Pilot confidence in use of their equipment must be to the degree that overreaction to situations will not result in exceeding the equipment's operational parameters. Implementation could be accomplished by unit SIP's stressing the operational capabilities and limitations of the equipment, proper methods of utilization and proper control actions in given situations.
213	MTP	15 (Repeat)	10 (Repeat)	6 USAAAVS inform personnel of problems encountered and remedies via the publication of confidence related articles in FLIGHT FAX and Aviation Digest.
214		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
214		Insufficient information to perform a human error (TEIR) analysis		
215		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		

CASE #215

Actions Completed

1. TSARCOM and Bell field representatives assisted unit maintenance personnel in inspecting janitrol heaters and identifying possible defects.

2. All janitrol heaters are in the process of being replaced with the same muff-type heaters utilized on the Bell 206.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
215	P	15 OH-58A pilot (PIC) on unit training mission involving snowfield operations performed a course of action prohibited by SOP. He landed aircraft on a snow covered area of a ridgeline without properly determining degree of slope. As a result, he failed to recognize 8 degree lateral and 10 degree forward slope conditions of the landing area prior to touchdown. The aircraft encountered mast bumping and sustained major damage upon landing.	6 OH-58A pilot (PIC) performed prohibited course of action (landed on snow covered area without properly determining degree of slope) because of inadequate judgment. The landing area he chose did not contain sufficient visual cues to determine degree of slope. Also, he was aware that another aircraft from his unit had already successfully landed to and departed from a more suitable area on the same ridgeline. Regardless, he elected to land to the area of his choice under the mistaken assumptions the area was level.	6 USAAAVS inform personnel of problems encountered and remedies concerning errors in judgment via FLIGHTFAX and Aviation Digest.
215	P	15 (Repeat)	13 OH-58A pilot (PIC) performed prohibited course of action (landed on snow covered area without properly determining degree of slope) because of possible carbon monoxide poisoning at time of accident. Post-accident analysis of blood sample taken from pilot shortly after accident revealed an unusually high (27%) level of carboxyhemoglobia later determined to be caused by a defect in the aircraft's heating system.	6 DARCOM inform personnel (users of OH-58A aircraft in Alaska) of problems encountered (possible defects in heater system) and remedies (grounding, inspection, testing and fix criteria) via safety of flight message.
215	P	15 (Repeat)	13 (Repeat)	6 USAAAVS inform personnel of problems encountered and remedies concerning effects of carbon monoxide on aviator performance via AVIATION DIGEST.

CASE # 215 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
215	P	15 (Repeat)	21 OH-58A pilot (PIC) performed a prohibited course of action (landed on snow covered area without properly determining degree of slope) because of inadequate supervision by higher command (Brigade). Although the Brigade issued an SOP requiring the use of markers to determine slope conditions, the brigade did not follow up to determine whether or not this requirement was being implemented when, in fact, it was not. Accordingly, when unit pilots were operating in areas where adequate visual cues on the ground were not available, the lack of adequate marking equipment to airdrop on snow covered landing areas and the lack of detailed implementing instructions left the pilots with no alternatives other than to land the aircraft in violation of the SOP or avoid landings in these areas completely.	7 Brigade should take positive command action to insure the section of the SOP addressing landings to snow covered areas void of adequate references for determining slope is complied with. To implement remedy, flight standardization resources organic to the brigade should be used to develop equipment (markers) and techniques necessary to insure compliance with the SOP.
215	P	15 (Repeat)	24 OH-58A pilot (PIC) performed prohibited course of action (landed on snow covered area without properly determining degree of slope) because of inadequate supervision by the operations officer. Although the mission to the assigned pilot (PIC) was classified as a maximum risk mission (practice snowfield landings and takeoffs with another pilot inexperienced in snow field operations), he was not qualified as an IP for type training mission, had not flown with an IP for 8 months and had not flown in snow operations for 5 months.	11 Brigade should improve monitoring of personnel and unit activities to detect and correct inequities in aviator/mission assignments at unit operations level. To implement remedy, TRADOC should insure that COI 2G-F15, "Aviation Commander's Readiness Course" includes training in how to properly monitor personnel and unit activities.

CASE #217

No action, other than at unit/local level, being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
216		No contributing materiel failure/malfunction.		
216	P	15 UH-1H pilot, landing at a tac LZ after completing a night range firing service mission, performed courses of action that are prohibited by TC 1-28, para 2-5b and 5-14a (7). After departing firing range with minimum dark adaptation of vision resulting from exposure to large floodlights at range site, pilot made landing approach with cockpit instrument lighting set at high intensity in contravention of para, 2-5b, TC 1-28. Also, although the LZ was partially obscured by patchy ground fog, he requested the searchlight be turned on in contravention of para 5-14a(7), TC 1-28. As a result, his night vision capability was impaired to the extent he was unable to clearly perceive the aircraft's rate of descent relative to the ground on short final and the aircraft landed hard sustaining major damage.	2 UH-1H pilot performed courses of action prohibited by TC (impaired his night vision by improper use of cockpit instrument lights and aircraft searchlight) because of inadequate unit training. Although he was faced with the requirement to land at a minimum lighted LZ partially obscured by patchy ground fog at night, the pilot's injudicious use of the aircraft's cockpit instrument lights and searchlight at the expense of retaining his visual dark adaptation clearly indicates his lack of understanding and knowledge of the night vision techniques and principles specified in TC 1-28.	2 Units upgrade/provide night vision training to place increased emphasis on dark adaptation, protection of night vision and night vision techniques. To implement this training, TRADOC should insure that a requirement for night flight training as prescribed in TC 1-28 appears in all ARTEPS for aviation units.
217		No contributing materiel failure/malfunction.		
217	IP	10 TH-55A IP on a primary training mission improperly monitored performance of personnel during the engine run-up procedures in violation of common practice by not anticipating the pre-solo SP's actions. As a result, when the student applied full collective pitch while executing the throttle override check, the IP was not in a position to prevent this action. Consequently, the aircraft pitched nose high, raised to a 2-3 foot height, pivoted counterclockwise and rolled left onto the ground incurring major damage.	8 TH-55A IP improperly monitored the performance of others (failed to anticipate the pre-solo SP's actions) because of overconfidence in others. The overconfidence stemmed from the SP's successful completion of this performance check on his previous flight and from a general feeling that this was an unlikely portion of the training period in which to encounter potentially dangerous difficulties.	6 Doss Aviation, Inc. inform personnel of the problems encountered when IP's fail to anticipate unexpected student pilot actions due to overconfidence either in the student or in one's own ability to control the situation and prevent dangerous situations from developing. This can be accomplished by flight commanders providing the necessary briefing to assigned TH-55A IP's.

Actions In Progress

Improved all metal tail rotor blades will soon be replacing the fiberglass blades on the OH-6. The metal blades should increase anti-torque thrust available by 20%.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
217	IP	10 (Repeat)	18 (Repeat)	6 USAAAVS inform personnel of problems encountered and remedies regarding over-confidence via articles in "FLIGHTFAX", the "Aviation Digest" and the "PREVENTER."
218		No contributing materiel failure/ malfunction.		
218	P	7 OH-6A pilot flying the last aircraft in a flight of 4, on approach, in a night formation flight in support of an FTX, made improper flight control actions in violation of common practice. When the third aircraft initiated a climb because it was under-arcing the proper approach angle, the fourth aircraft had already slowed to an airspeed less *than that of translational lift*. In order to stay in formation with the third aircraft, the pilot of the fourth aircraft abruptly applied collective and either applied insufficient left pedal or exceeded the aircraft's directional control ability. As a result, the aircraft yawed right causing the pilot to lose his only visual reference, the aircraft ahead of him. Unable to acquire a new reference because of the darkness of the night combined with his low altitude and restricted outside visibil - ity caused by glare from his landing and position lights, the pilot became spatially disoriented and allowed the yaw to continue into a right spin. In his attempt to regain control of the aircraft, the pilot made an inadvertant collective reduction and the aircraft descended into the trees.	5 OH-6A pilot made improper flight control actions (abrupt control inputs which exceeded either his ability to maintain aircraft control or the aircraft's directional control authority) because of inadequate attention. The pilot channelized his attention on the aircraft on which he was flying formation and failed to properly divide his attention among required flight activities, especially making smooth coordinated control inputs and maintaining trim.	2 Upgrade unit training by providing a comprehensive night training program which progresses from basic to advanced tasks and which stresses proper division of attention and smooth and coordinated control inputs. Such a program would insure aviator competence in night operations *prior to their release* as pilot in command and could be implemented by writing a night operations SOP (IAW AR 95-5 para 3-1) requiring this training. The training program could be accomplished utilizing assigned IP's.

CASE # 218 continued

CASE # 219 No contributing materiel failure/malfunction
Insufficient information to perform a human error (TEIR) analysis

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
218	P	7 (Repeat)	2 OH-6A pilot made improper flight control actions (abrupt control inputs which exceeded either his ability to maintain aircraft control or the aircraft's directional control authority) because of inadequate unit training. The unit's training program did not adequately prepare the pilot for night formation operations into a tactical LZ. This flight was the pilot's first night formation flight in the OH-6A.	12 Unit commander should improve his monitoring of personnel and unit activities by insuring that aviators receive required training and that they are properly qualified for the mission they are to perform prior to their release as PIC. TRADOC should insure that the Aviation Commander's Readiness Course (COI 2G-F15) includes training on how to monitor subordinate personnel and unit activities.
218	P	7 (Repeat)	2 (Repeat)	5 Unit Operations Officer should insure personnel are ready/capable of performing job assigned regarding their training and experience by implementing required training programs and by insuring that mission and aircraft assignments are within aircrews' current capabilities IAW AR 95-5 para 3-1. The Operations Officer can be better qualified to perform these duties by TRADOC providing an Aviation Operations Officer Course.
219		No contributing materiel failure/ malfunction.		
219		Insufficient information to perform a human error (TEIR) analysis.		

CASE #220

Action Completed

FLIGHTFAX article (Vol. 6, No. 8, 23 Nov 77), fixed wing mishap briefs, discussed events of this mishap.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
220		21 T-42A on a day training mission experienced a landing gear malfunction (partial retraction). After takeoff at 300 ft AGL and 110 KIAS, the landing gear failed to completely retract. Emergency procedures to include manual extension were unsuccessful in lowering the gear. The aircraft was landed with the gear partially extended (10 inches) resulting in minor aircraft damage.	30 T-42A experienced a landing gear malfunction (partial retraction) because manufacturer assembly was performed inadequately. A cotter pin was not installed in the worm gear positioning nut (PN 35-810147) during the manufacturer overhaul of this assembly nine months prior to this mishap. The positioning nut came off the worm gear resulting in the loss of the thrust bushing and malfunction of the landing gear system.	11 DARCOM COR encourage the manufacturer to improve monitoring of overhaul facility activities to insure quality, "by-the-book" maintenance is produced. Possible solutions would include informing manufacturer of failure/malfunctions resulting from substandard maintenance and the use of contract penalty clauses.
220		21 (Repeat)	30 (Repeat)	11 DARCOM require COR to improve monitoring by the military quality control personnel of the manufacturer's maintenance activities. A possible solution would be more frequent spot checks of the manufacturer's products.
220		Insufficient information to perform human error (TEIR) analysis.		
221		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		

CASE #221

No action, other than unit/local level, being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
221	P	3 AH-1G pilot on a tactical training mission was flying the last aircraft in a four ship NOE formation. As he slowed his aircraft and lost translational lift, he applied full left pedal to maintain aircraft heading. The aircraft began to turn right because of inadequate tail rotor thrust resulting from a combination of high power setting, gross weight and density altitude. The pilot misinterpreted this aircraft characteristic as a mechanical tail rotor failure. As a result, he initiated the emergency procedure for loss of tail rotor thrust by reducing the throttle, an action that worsened the situation of inadequate tail rotor thrust. The pilot then applied aft cyclic to miss a sand dune and the main rotor struck the tailboom. The aircraft came to rest upright having incurred minor damage.	2 AH-1G pilot misinterpreted an aircraft characteristic (interpreted inadequate tail rotor thrust available as a tail rotor failure) because unit training was inadequate. The unit standardization program did not adequately train the pilot how to recognize and react to the characteristics and indications of the various types of tail rotor system failures and limitations.	2 Upgrade unit training to adequately acquaint unit aviators with the functioning of the tail rotor in normal and emergency modes. This can be implemented as an adjunct to required standardization flights and through classroom instruction provided by standardization personnel.

CASE #221 continued.

Note insufficient information to perform a materiel failure/malfunction (FIRE) analysis.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
221	P	8 (Repeat)	2 AH-1G pilot misinterpreted an aircraft characteristic (interpreted inadequate tail rotor thrust available as a tail rotor failure) because unit training was inadequate. The unit PIC training program did not adequately familiarize the pilot with the unit mission nor was he adequately trained in desert operations where the combinations of high density altitude and high temperature create conditions of marginal tail rotor authority when combined with high winds and high aircraft gross weight as were present on the day of the mishap. The pilot had not received any further tactical NOE training since his NOE standardization ride, nor had he received any formal training in desert operations. Furthermore, he had not flown the time in the local area recommended by the unit SOP for release as a PIC and the time that he had flown was not in the unit mission. Also, at the time of the mishap, the pilot was unaware that the other aircraft were operating with reduced fuel loads.	2 Upgrade unit training to provide a PIC program which insures that the pilot is adequately trained in the unit mission, its application, and in desert operations. This can be accomplished by insuring that the 50 flight hour requirement of the SOP is enforced and that it is flown in the unit's mission. It should also be insured that the unit ATM program is tailored to the unit mission.

CASE #221

No action, other than unit/local level being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
221	P	1 AH-1G pilot on a tactical training mission involving terrain flight, failed to perform adequate flight planning as is required by AR 95-1, para 4-1 and FM 1-1, para 1-5. The pilot neither consulted the performance charts in the operator's manual to determine the maximum allowable aircraft gross weight for an out-of-ground effect hover under ambient conditions in the area of operations, nor did he attempt to conduct an out-of-ground effect hover check prior to performing terrain flight (FM 1-1, para 1-5). As a result, the aircraft took off over maximum gross weight for out-of-ground effect hovering. Eleven minutes after takeoff the pilot slowed the aircraft to a speed below that of translational lift while in a downwind condition. Full left pedal was not sufficient to maintain aircraft heading and the aircraft began to turn right, an action which the pilot misinterpreted to be a tail rotor failure. He consequently applied an improper emergency procedure which resulted in the crash of the aircraft.	2 AH-1G pilot failed to perform adequate flight planning (operator's manual performance chart limitations and an OGE hover check) because of inadequate unit training. The unit training program had not adequately emphasized the hazards peculiar to the local flying area, especially the high D.A.. It also had not impressed upon the pilot the necessity of using performance charts prior to flight or of performing OGE hover checks prior to performing terrain flight.	2 Upgrade unit training to insure that local flying area hazards are adequately emphasized to unit aviators and to insure that they are fully cognizant of the necessity of adequate preflight and inflight planning. This can be accomplished in concert with required training utilizing unit instructor personnel.
222		No contributing materiel failure/ malfunction.		

CASE #222

Actions In Progress

1. Improved all metal tail rotor blades will soon be replacing the fiberglass blades on the OH-6. The metal blades should increase anti-torque thrust available by 20%.

2. AVRADCOM is presently looking into tail rotor stall in the OH-58. Some of the data/procedures from that study may also apply to the OH-6.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
222	P	9 OH-6A pilot while flying CRF time following a weekend CPX improperly monitored his instruments in violation of common practice. During an out-of-ground-effect (OGE) hover (300' - 400' AGL), he did not notice he was losing N_2 until it was brought to his attention by the crew chief. The crew chief was unsuccessful in his first attempt to get the pilot's attention (as N_2 was decreasing through 90%), but finally succeeded as the N_2 decreased through 80%. A slow turn to the right began as effective anti-torque control was lost and rapidly progressed to a violent spinning descent terminating in total loss of the aircraft.	5 OH-6A pilot improperly monitored his instruments while hovering OGE (did not realize his N_2 was decreasing until it was brought to his attention by the crew chief) because of inadequate attention. His entire attention was directed outside the aircraft to relatives and friends on the ground, over whose home he had established a high hover, instead of cross-checking his instruments. By not cross-checking his instruments, he was not aware of the decrease in N_2 until the crew chief directed his attention to it. By that time N_2 had decreased to a point where neither directional control nor altitude could be maintained.	6 USAAAVS should inform personnel of problems encountered and remedies via meetings, publications and directive messages in order to insure that all aviators are aware of the importance of dividing one's attention to permit continuous cross-check of instruments and resultant immediate awareness of potential problems. This can be implemented through the medium of FLIGHT FAX.

CASE #223

Actions Completed

The retaining ring (PN 6850734) was last installed at Sharpe Army Depot in April 1974. Corpus Christi Army Depot presently overhauls all T63-A-700 engines. Quality control and standardization should be enhanced by having only one facility conduct engine overhauls.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
222	P	7 OH-6A pilot while flying CRF time following a weekend CPX performed an improper flight control action contrary to common practice. While at a 300' - 400' hover, the pilot experienced a loss of N_2 and a turning of the aircraft to the right that began slowly but accelerated when proper control action was not applied, The decreasing N_2 resulted in ineffective anti-torque control. The emergency was identified by the pilot as "settling with power" and he applied some forward cyclic pitch but did not reduce collective pitch. An immediate reduction of collective pitch would have alleviated either or both the ineffective anti-torque control or settling with power. The absence of proper control action resulted in the aircraft continuing in an accelerating turning descent until it impacted the ground.	19 OH-6A pilot performed an improper flight control action (did not reduce collective pitch to alleviate loss of effective anti-torque control he thought was caused by "settling with power") because of inadequate written procedures for operation in normal man-machine-environmental conditions. TM 55-1520-214-10 does not address the condition commonly known as "settling with power" nor loss of effective anti-torque control at a hover within the AVOID area of the Height-Velocity Diagram.	3 DARCOM should revise procedures for normal operation: TM 55-1520-214-10, to provide a discussion of how to recognize and recover from "settling with power" and loss of effective anti-torque control at a hover within the AVOID area of the Height-Velocity Diagram. Consideration should also be given to including in appropriate TM's a similar discussion as it applies to other R/W aircraft in the US Army.
223		23 OH-6A experienced a power plant (internal components) failure. The A/C was at 900' AGL, 90 KIAS, straight and level cruise flight when the power plant malfunctioned. The pilot attempted a power-on landing but at 125' and 50 KIAS, the engine failed completely, necessitating an autorotative landing resulting in major damage.	18 OH-6A experienced a power plant (T63A700) oil sump caplock spring retaining pin (PN 6850734) failure because maintenance assembly was performed inadequately. The lock spring retaining pin broke permitting the oil sump cap to unscrew from the turbine support assembly thus allowing the gas producer turbine to shift and contact the case, resulting in massive internal failure. The retaining pin failed through local overstress mechanisms probably from an improperly torqued oil sump cap bolt.	11 Higher command (DARCOM) initiate action to insure proper assembly by overhaul facilities. A possible solution would be spot checks by quality control personnel of in-progress assembly.

CASE #224

Actions Completed

1. FLIGHTFAX article (Vol 6, No. 16, 8 Feb 78), subject: "Unauthorized Low-Level Flights Kill Five," profiles three wire strike accidents that occurred in December 1977.

2. FLIGHTFAX article (Vol. 6, No. 17, 15 Feb 78), subject: "Wire Strikes on the Rise," presents some wire strike mishap experience, and outlines some positive steps that can be taken to prevent wire strike mishaps.

3. FLIGHTFAX article (Vol. 6, No. 35, 21 Jun 78), subject: "Wire Strikes - 90% Unnecessary," points out that the increase in wire strike mishaps indicates a lack of flight discipline.

4. USAAAVS provided USAAVNC (ATZQ-ES) with a recommended change to AR 95-1. The change essentially would have required that pilots be on an authorized and planned low level type mission in an authorized training area before engaging in low level type missions. The recommendation was not accepted; however, USAAAVS will continue its efforts in the direction outlined above.

Actions in Progress

1. A draft Letter of Agreement (LOA) Requirements Document, prepared in coordination with USAAVNC and the Aviation Center Team, on a Wire and Wire-Like Object Detection System is presently being processed through channels.

2. A helicopter wire cutter Letter of Agreement (LOA) is currently being drafted with a goal of getting some type of wire cutting device on Army helicopters. In the interim R&D efforts are underway to determine the feasibility and problems associated with putting such devices on helicopters.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
223		No contributing human error.		
224		No contributing materiel failure/ malfunction.		
224	P	15 OH-58A pilot on a cross-country training flight performed a course of action that is prohibited by FAR 91.79, para (d). He operated a helicopter at an unauthorized altitude of approximately 150 feet AGL thereby becoming a hazard to property on the surface. The property on the surface was a set of wires, spanning a draw leading away from a lake, which were struck by the helicopter. Major damage to the aircraft was sustained; however, control of the aircraft was retained and the aircraft was flown approximately 1000 meters and landed adjacent to a hard surfaced road.	6 OH-58A pilot performed a prohibited course of action (conducted a cross-country flight at an altitude that resulted in striking a set of wires spanning a draw) because of inadequate judgment. He elected to fly at an altitude that was not without hazard to property on the surface of the earth knowing full well that such flight was prohibited.	3 ODCSOPS revise procedures for normal operations: AR 95-1 to address the conduct of terrain flight and restrictions thereto, i.e., minimum altitudes, authorized areas, etc.
225		No contributing materiel failure/ malfunction.		

CASE #225

Actions Completed

1. Safety of flight message, USAAAVS, 072100Z Apr 78, subject: Automatic Opening Devices in Conjunction With Sport Parachute Missions.

2. Article published in FLIGHTFAX, 14 Dec 77, Vol. 6, #11, "Parachute Automatic Opening Devices."

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
225	OAY	16 A jumpmaster of a sport parachute club, while being supported by a UH-1H on a service mission to drop parachutists, failed to perform a course of action that is required by United States Parachute Association (USPA) Publications, part 114, and Mandatory Operating Procedures, page 12, published by the manufacturer for use of the Sentinel MK 2000 automatic emergency parachute pack release system. After having decided to abort the parachute jump mission, he failed to disarm the automatic opening device being used by one parachutist, as prescribed. As a result the device was actuated by the aircraft's descent releasing the reserve parachute of the parachutist who permitted the parachute to deploy out the door. The increased drag caused by the released parachute caused the pilot to think he had lost the tail rotor. He entered autorotation and sustained major damage during the termination.	19 A jumpmaster failed to perform a course of action that is required by USPA Publications and manufacturers' operating instructions (did not disarm an automatic opening device being used by one of the parachutists after having decided to abort the parachute jump mission) because of inadequate written procedures for normal operations. He had interpreted the manufacturer's instructions which state "If the jump is aborted for any reason, the MK 2000 should be disconnected from the cartridge" to not be mandatory and consequently did not disarm the device.	3 HQDA (DAAG-RE-S) revise AR 95-19 to provide procedures for normal operation in paragraph 5, Section 1, to include procedures for use of all automatic opening devices especially when they will be armed and disarmed (i.e., whenever parachutist is returning to the ground aboard the aircraft and before the descent is begun). The Adjutant General should also request USPA to change paragraph 114.100 entitled Descent and Landing in Aircraft to read: "1. All automatic openers: disarm/ disconnect before descent begins."
226		No contributing materiel failure/ malfunction.		

CASE #226

Refer to Case #224 and #231 for actions completed and in progress.

CASE #228

Actions Completed

FLIGHTFAX article (Vol. 6, No. 14, 25 Jan 78), subject: "Minimal Light Operations," emphasized the lightning requirements for minimum light approaches per TC 1-28. Night vision, autokinesis, and fascination were discussed in the article.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
226	P	15 OH-58A pilot on a service mission (return flight after pax delivery) performed a course of action that is prohibited by Command Aviation Standard Operating Procedure Chapter 4, para 4-10. The pilot flew low level down a river which violates the Command policy requiring a minimum operating altitude of 500 feet above the highest obstacle along the flightpath. As a result, the pilot struck electrical cables crossing the river that were not marked or visible due to terrain masking of the utility poles. The aircraft crashed inverted resulting in total loss damage.	6 OH-58A pilot performed a course of action prohibited by Command SOP (unauthorized low level flight below 500 feet above highest obstacle) because of inadequate judgment. The pilot "was a capable and experienced pilot (unit SIP) who was knowledgable in the appropriate regulation concerning the altitude restriction for low level flight but his demonstrated disregard for this regulation indicated poor judgment on his part.." The board did not uncover any previous violations of flight discipline.	7 Command should take positive command action to encourage proper performance and discourage improper performance, with regard to the aviator following written regulations procedures or guidelines.
227		Test Aircraft.		
228		No contributing materiel failure/ malfunction.		
228	P	16 OH-58A pilot, during a tactical landing approach at night under minimum lighting conditions (flashlight wedged among rocks on the ground) failed to perform a course of action required by common practice. He was approximately 100 feet on short final when he realized he was overshooting his touchdown point. He began to slow the forward movement of the aircraft and apply power but could not terminate at the preselected spot. As he passed the flashlight marking his landing point, he lost all ground references and attempted to stop the aircraft at hover without the benefit of his landing light. The aircraft impacted the ground and sustained minor damage.	6 OH-58A pilot failed to perform a course of action required by common practice (neglected to turn on his landing light when he lost ground reference as he overshot his preselected landing spot during a minimum light night landing) because of inadequate judgment. He realized he was overshooting his preselected landing spot when he was 100 feet from it, but elected to recover the aircraft without the benefit of his landing light, even when he lost all ground reference.	6 USAAAVS inform personnel of problems encountered and remedies via FLIGHT FAX. This can be implemented by publishing an inadequate judgment-related article emphasizing proper procedures/techniques for night flight as prescribed in TC 1-28.

CASE #227 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
228	P	16 OH-58A pilot, during tactical landing training at night improperly performed a course of action that is required by TC 1-28. He placed a single flashlight among some rocks to use as a landing reference instead of using the approved method of a lighted "T" or inverted "Y" as prescribed in para 5-14b, TC 1-28. As a result, his perception was faulty and he did not stop at the preselected landing spot. He lost all ground references as he passed the flashlight marking his landing point and while attempting to stop the aircraft at a hover, permitted the aircraft to impact the ground sustaining minor damage.	19 OH-58A pilot during tactical landing traing at night improperly performed a course of action that is required by TC 1-28 (used a single light to land instead of a lighted "T" or inverted "Y" as prescribed in TC 1-28) because of inadequate written procedures for operation in normal man-machine-environmental conditions. The unit SOP permits landing to only one light during tactical night operations/training.	3 Unit revise procedures for normal operation: SOP, so that it will be compatible with TC 1-28 concerning the use/arrangement of lights for ground landing reference during night tactical training.
229		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
229		Insufficient information to perform a human error (TEIR) analysis.		
230		No contributing materiel failure/ malfunction.		

CASE #229

Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.

Insufficient information to perform a human error (TEIR) analysis.

CASE #230

No action, other than unit/local level, being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
230	IP	16 AH-1G IP on a transition training mission conducting low level night autorotations failed to perform a course of action required by common practice. He failed to take corrective action when the pilot began applying cushioning pitch at 10 feet, an appropriate altitude for initial collective pitch application (TC 1-36, para 4-5, w(3)), but too high for cushioning pitch. Consequently insufficient rotor RPM remained to smoothly cushion the touchdown and a hard landing resulted.	6 AH-1G IP failed to perform a required course of action (failed to take corrective action when the *pilot began applying cushioning pitch too high*) because of inadequate judgment. The IP was aware that the pilot's cushioning pitch application was too high, but chose not to take corrective action because he did not perceive it to be a problem.	2 Unit commander should upgrade unit training to emphasize the necessity of good IP judgment in all phases of standardization training by establishing a structured standardization program which places particular emphasis upon when to take corrective action when a student has performed an improper autorotative pitch application. SIP's should stress to IP's during required flight examinations the relationship between autorotative pitch application and rotor depletion. This remedial measure can be implemented using assigned standardization personnel.
230	P	6 AH-1G pilot on a transition training mission conducting low level night autot tations inaccurately estimated clearance/closure. He misjudged his altitude and began *applying cushioning pitch* too high (10 ft). As a result, insufficient rotor RPM remained to smoothly cushion the touchdown and a hard landing resulted.	5 AH-1G pilot inaccurately estimated clearance/closure (misjudged altitude) and applied cushioning pitch too high) because of channelized attention. The pilot became visually fixated with a point on the ground on the right side of the aircraft. This visual fixation adversely affected his depth perception causing him to misjudge his altitude.	2 Unit commander should upgrade unit training to emphasize the importance of proper division of attention, especially as it applies to night vision techniques. Unit standardization personnel can provide this training in conjunction with required unit standardization training. TC 1-28, para 2-7, should be used as a guide in planning instruction on night vision techniques.
231		No contributing materiel failure/ malfunction.		

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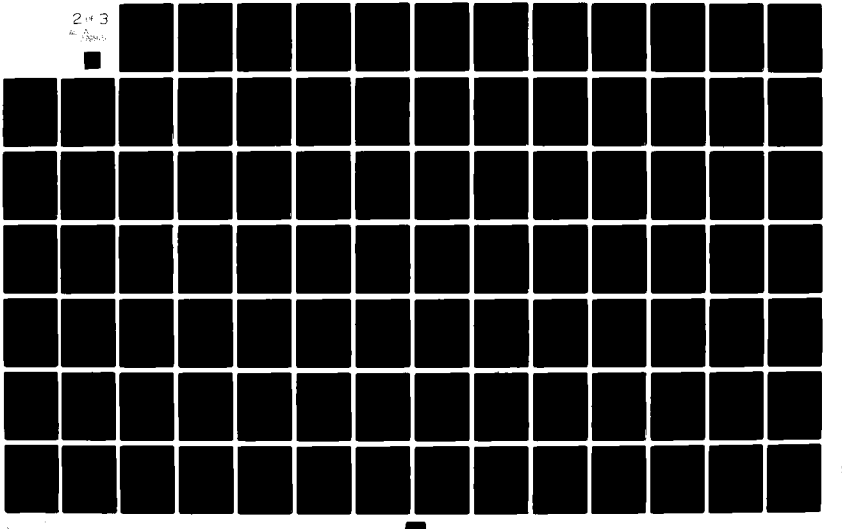

CASE #231

Actions Completed

1. The 500' AGL minimum altitude contained in ARNG msg 291432Z Aug 75 has been incorporated in NGR 95-1 dated 21 Dec 1977.

2. Refer to Case #224 for additional actions completed and in progress.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
231	P	15 OH-6A pilot during a night CRF flight performed a course of action prohibited by directives and FAR 91.79, para (d). He operated a helicopter at an altitude of 300 feet AGL which is below that permitted by the Command (500 feet AGL). As a result he became a hazard to property on the surface (power line) which he flew through in violation of FAR 91.79 para (d). The aircraft became a free falling body and came to rest at a point in the trees where his momentum carried him.	6 OH-6A pilot performed a prohibited course of action (conducted night flight at an altitude below 500 feet AGL that resulted in flying through a power line) because of inadequate judgment. He was apparently flying up and down the highway at an unnecessarily low altitude with his landing light turned on to show off his ability and proficiency to an unauthorized passenger in the aircraft.	7 Command should take positive command action to encourage proper performance and discourage improper performance with regard to aviators following written regulations, procedures or guidelines.
232		No contributing materiel failure/ malfunction.		

CASE #232

No action, other than unit/local level being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTIONS	SYSTEM INADEQUACY	REMEDIAL MEASURE
232	P	9 UH-1 pilot, enroute to pick up (extract) troops from a simulated tactical position at first light, improperly monitored instruments (altimeter) contrary to common practice. Day and night flying over desert is characterized by a lack of adequate depth cues. This results in poor or diminished depth perception and, consequently, potentially dangerous situations especially if the area is void of ground light references. The pilot took off one hour before sunrise with only a distant mountain horizon as a ground reference. He made a turn and reduced his power setting and airspeed but neglected to confirm his altitude with his altimeter which was the only reference for vertical terrain clearance available to him. As a result the aircraft descended and impacted a dry lake bed in a near level attitude sustaining major damage.	2 UH-1H pilot improperly monitored instruments (altimeter) (took off at night without visual terrain reference except a distant mountain horizon and neglected to confirm his altitude with his altimeter) because of inadequate unit training. After having experienced a 40% reduction in programmed flying hours by FORSCOM for FY78, the remaining hours were reallocated by the Bn Cdr to further reduce individual and unit training flying hours to make available additional support flying hours. The Bn Cdr's rationale was that aviators would be trained as they flew support missions for the infantry. The flying hours remaining for individual and unit training would only permit accomplishment of necessary instrument renewals and annual standardization rides prescribed by AR 95-1.	2 Units upgrade/provide unit training to assure that adequate progressive training is presented the aviators in a controlled environment and that unit training flight hours are not sacrificed in the interest of troop support. This can be implemented by MACOMS directing utilization/allocation of a minimum number of flying hours for unit training/ orientation prior to participation in troop support missions.

CASE #233

Actions in Progress

An improved heater/defogging system is a scheduled product improvement for both the OH-58A and OH-58C.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
233		35 OH-58A electrical system (heater/defogging system) did not operate as intended. While hovering for takeoff from a field location covered with snow, the windscreen defogging system failed to adequately clear the inside of the windscreen of moisture and the pilot experienced a "white-out" condition, lost control of the aircraft, and struck the ground rolling the aircraft on its right side resulting in major (total) damage.	16 OH-58A electrical system (heater/defogger) did not operate as intended because it is inadequately designed for required operating conditions. The defogging system does not remove a sufficient amount of moisture from the inside of the wind-screen when the aircraft is operated in snow conditions. This incomplete defogging, coupled with decreased visibility from blowing snow, increases the possibility of the crew losing ground reference and becoming disoriented.	9 DARCOM initiate action to redesign the heater/defogging system to ensure the capability exists for the system to remove the moisture from the inside of the windscreen during operations in a high humidity environment. A possible solution would be to increase the capacity of the blower in the heater/defogging system to provide a greater volume of air to clear the windscreen.
233	P	16 OH-58A pilot, on a service mission in support of a field exercise failed to perform a course of action required by FM 1-51 para 7-11a and his unit aviator reading file. After hovering for takeoff from a snow covered field and electing not to depart because of deteriorating weather conditions, the pilot began to return to his original position. To reposition, he used a normal hover rather than an out-of-ground-effect hover or a hover at a speed above translational lift. As a result, the aircraft became engulfed in blowing snow and the pilot lost visual reference causing him to lose control of the aircraft. It struck the ground and folled on its side incurring damage which resulted in the total loss of the aircraft.	7 OH-58A pilot failed to perform a course of action required by FM 1-51 para 7-11a (used a normal hover rather than a high or fast hover in loose snow) because of overconfidence in self. The pilot had used a normal hover in conditions conducive to blowing snow previously and had encountered no difficulty, thus he felt confident that there was no need to use special techniques this time.	6 USAAAVS should inform personnel of the dangers encountered as a result of over confidence, particularly as it relates to snow operations, via articles in FLIGHT FAX and the Aviation Digest.

CASE #234

No action other than unit/local level being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
234		No contributing materiel failure/ malfunction.		
234	P	16 UH-1H pilot (PIC), on a practice airmobile mission, failed to perform a course of action required by common practice. During an approach to an unimproved landing zone he advised the copilot to land as close to the trees as possible. When it became obvious that the copilot was maneuvering the aircraft too close to the trees for a safe landing, the pilot failed to take timely corrective action. As a result, the main rotor blades struck four trees during the descent. The subsequent loss of RPM caused the aircraft to land hard resulting in failure of the landing gear.	8 UH-1H pilot (PIC) failed to perform a required course of action (failed to take corrective action) because of overconfidence in others (copilot's flying ability). This was fostered by previous flights with the copilot and reports from other pilots-in-command and IP's who had flown with the copilot. Because of his overconfidence in the copilot, he allowed him to fly the entire mission while he did the navigating and radio work. During the approach he monitored the instruments and when he noticed the copilot maneuvering close to the tree line, he failed to take timely corrective action.	6 USAAAVS should inform aviation safety personnel of problems encountered by providing them with topics for unit safety meetings focusing on instances of overconfidence in others. Articles pertaining to overconfidence in others should also be published in Aviation Digest and FLIGHT FAX.
234	CP	6 UH-1H copilot, on a practice airmobile mission, inaccurately estimated his clearance while on an approach to an unimproved landing zone. As a result, he maneuvered the aircraft too close to a tree line during the approach allowing the main rotor blades to strike four trees during the descent. The subsequent loss of RPM caused the aircraft to land hard causing the landing gear to fail.	12 UH-1H copilot inaccurately estimated his clearance during an approach to an unimproved landing zone because of excessive self-motivation. The pilot advised the copilot to land as close to the trees as possible. Because the copilot was soon scheduled to become a PIC, he was overly anxious to fulfill the expectations of his peers as well as his platoon leader; therefore, as he got near the trees he failed to allow himself enough margin for a safe landing.	12 Unit commanders should improve monitoring of personnel and unit activities to detect excessive self-motivation as related to safe operation of aircraft. Such monitoring should be increased during field training exercises to insure that common safety practices are not sacrificed in accomplishing their mission. To implement this remedy, TRADOC should insure that USAAVNC COI 2G-F15, "Aviation Commander's Readiness Course" and COI 2-1-C32 "Aviation Warrant Officer's Advanced Course" include this as a training objective. Additionally, USAAAVS should also include this in their aviation safety courses.

CASE #235

Actions Completed

USAAAVS recommended a change, incorporated in TM 55-1520-228-23-1 and TM 55-1520-228-PM, which established the requirement to replace the fuel pump filter element and clean the fuel control filter assembly every 300 hours or 12 calendar months, whichever occurs first.

Actions in Progress

In August 1978 USAAAVS notified TSARCOM that mishap data indicated that a fuel filter valve drain, similar to that installed on the Bell 206, was necessary on the OH-58. Evaluation and testing is in progress.

CASE #236

Actions Completed

1. TSARCOM issued safety of flight message, 171500Z Jan 78, P1 Multiplier, grounded all aircraft until all P1's were modified.

2. Article published in FLIGHTFAX, Vol. 5, #9, Dec 76, "Know Your Emergency Procedures."

3. Article published in FLIGHTFAX, Vol. 5, #19, Mar 77, "A Look at P1 Multiplier Failures."

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
235		38 OH-58A experienced an engine flame-out when the fuel system provided the engine with a fuel-water mixture. The aircraft was at 50 feet AGL and 30 KIAS in a climb following takeoff when the flame-out occurred. The aircraft was autorotated to a snow landing resulting in major damage.	16 OH-58A experienced an engine flame-out because the filter system of the engine fuel pump (PN 6854292) is inadequately designed for required operations. The current design permits sufficient water to accumulate in the filter over a period of time to produce an engine flame-out when the water is ingested by the engine.	9 DARCOM initiate action to redesign the engine fuel pump assembly to prevent an accumulation of water over a period of time. A possible solution could be the incorporation of a manual drain on the engine fuel pump filter.
235		No contributing human error.		
236		23 UH-1H experienced an engine (fuel control) malfunction. The aircraft was at 400-500 ft AGL and 90 KIAS in a left-hand turn when the engine fuel control malfunctioned. The aircraft was autorotated into heavy trees sustaining major total damage.	16 UH-1H experienced an engine malfunction when the fuel control P_1 multiplier connector assembly (PN 93194) failed because it was inadequately designed for required operating conditions. Resonant vibrations caused a reverse bending of the connector rod which in turn caused a fatigue mechanism at a brazed point on the rod and resulted in failure.	9 DARCOM redesign the fuel control to alleviate failure of the P_1 multiplier assembly connector. (Note: As a result of this accident, DARCOM directed all A-5 and A-6 Series fuel controls be removed from service and replaced with improved A-7 Series controls which eliminates the brazed point and replaces it with a cross pin connector.)
236		No contributing human error.		

Actions Completed

1. TSARCOM/Product Assurance conducted quality audit of propeller and propeller control overhaul areas at New Cumberland Army Depot requiring a follow-up report of corrective actions taken. A follow-up audit will be conducted during the time period 19-23 Mar 79 to insure all corrective actions have been implemented.

2. FLIGHTFAX article (Vol. 6, No. 19, 1 Mar 78), fixed wing mishap briefs, discussed events of this mishap.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
237		29 OV-1C experienced a No. 1 propeller malfunction (pitch lock assembly). At approximately 1000 feet AGL and 140 KIAS on climbout following takeoff, the aircraft experienced a malfunction of the No. 1 propeller when a propeller pitch lock piston ring (PN 553674) stuck. The aircraft stayed in the airport traffic pattern and crashed while turning final approach with total damage.	18 OV-1C experienced a No. 1 propeller malfunction because of inadequate maintenance. Disassembly of the malfunctioning propeller's pitch lock assembly disclosed a quantity of small glass beads imbedded in the piston ring groove causing the ring to stick and the pitch lock assembly to malfunction. Analysis of the glass beads found them to be the same type as used in glass bead peening at the overhaul facility. It is suspected the glass bead contamination occurred during overhaul of the propeller at the depot.	6 USAAAVS inform personnel of the importance of keeping work areas and parts clear of contaminants when assembling aircraft components. Aviation publications such as FLIGHTFAX are good medias for information transmittals.
237		29 (Repeat)	18 (Repeat)	11 DARCOM improve monitoring of the overhaul activities at the Depot to insure proper procedures and good maintenance practices are being utilized. An inspection should be performed to assure assembly areas are not contiguous with work areas in which contaminates might be in the air.

CASE #237 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
237		23 OV-1C experienced malfunctions of the No. 2 engine. During turn to final and at an altitude of approximately 300 feet AGL and 140 KIAS, the pilot attempted to add power to the No. 2 engine. It is suspected the No. 2 engine experienced a partial power loss and possible surges. This condition, coupled with a malfunctioning pitch lock assembly on the No. 1 propeller, resulted in the aircraft crashing with total damage while turning final approach for the airport.	18 OV-1C experienced a No. 2 engine malfunction because of inadequate maintenance. Teardown of the No. 2 engine revealed impeller assembly contact (over a period of time) with the housing and resultant metal machining. This condition precluded the engine developing full power. The fact that no compressor shift or bearing misalignment could be detected lead the CCAD analyst to conclude: "It is suspected the old high speed rub noted on the impeller housing was a result of improper practices employed (by the overhaul facility) at the time of overhaul."	11 DARCOM improve monitoring of the turbine engine rebuild facility to insure engine maintenance practices and inspection procedures are precise and that no deviations from standard overhaul practices are permitted.

CASE #237 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE /MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
237	P	6 OV-1 pilot of a short wing, drop tank equipped OV-1C aircraft on an infrared training mission inaccurately estimated closure rate (landing approach path and rate of descent in relation to touchdown point) in contravention of common practice. Shortly after takeoff, at near gross weight condition, he reported to the tower he had a runaway propeller and requested a return for landing. During descent on downwind and base leg, he extended the speed brakes and lowered the landing gear. Flaps were either not lowered or were retracted later during turn to final. As the approach continued, he failed to detect soon enough that the established rate of descent would result in undershooting of the runway. Therefore, he did not compensate with options that may have helped to safely reach the runway, such as turning base sooner to shorten the approach path or jettisoning the drop tanks to improve aircraft performance. As a result, when he rolled the aircraft into a steep bank to align the aircraft with the runway on final, the factors of weight, drag, angle of bank, airspeed and engine/propeller problems at this point caused the aircraft to enter a high rate of descent and contact the ground one-half mile short of runway.	6 It is suspected that the pilot inaccurately estimated closure rate (failed to timely recognize and compensate for pending undershoot of runway) because of inadequate judgment. Although the pilot encountered what he thought was a propeller malfunction at a favorable altitude (approximately 2000' AGL) in close proximity to the airfield, he chose to extend speed brakes, lower landing gear and commit the aircraft to the resulting rate of descent before positively insuring he could safely reach the runway. These courses of action reduced his margin for timely detecting and correcting his error in estimating rate of closure. By the time the pilot recognized the high rate of descent and the pending undershoot of the runway, it was too late to jettison the drop tanks to effect a safe recovery or complete a safe ejection.	2 Unit commanders (flight facility commanders) responsible for conducting OV-1 training should upgrade unit training to insure OV-1 aviators are fully aware of the importance of judgment during emergency situations. Emergency procedures outlined in the Operator's Manual should be continuously reviewed and should by all assigned aviators. Emphasis should be placed on flight characteristics of all OV-1 aircraft, fully loaded (tip tanks included), under single engine operation. Discussion should also include how to recognize the need for ejection when the situation becomes imminent. To insure implementation of remedial measure, the National Guard Bureau should closely evaluate OV-1 aviator training and standardization during scheduled visits to these type units.

CASE #237 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
237	P	6 (Repeat)	6 (Repeat)	6 Aviation Safety Officer inform personnel of problems encountered and remedies via safety meetings. Such meetings should stress hazards involved in pilots using poor judgment during emergency situations. To implement this remedial measure, USAAAVS should provide ASO's with "judgment" related accident information.
237	P	6 (Repeat)	20 Pilot inaccurately estimated closure rate because of inadequate written procedures for operation in abnormal/emergency man-machine-environmental conditions. TM 55-1510-204-10/4 para 4-35 and 4-43 do not explain the optimum procedures which should be used during emergency landing conditions (single engine) when attempting landing with wing stores near max gross weight.	4 DARCOM revise procedures for abnormal/emergency operations in TM 55-1510-204-10/4. The revision should discuss jettison of full external fuel tanks, the employment of high drag devices (speed brakes), the employment of high lift devices (flaps), lowering of the landing gear and optimum approach techniques to avoid steep turns to final.
238		No contributing materiel failure/ malfunction.		

CASE #238

Actions Completed

1. Insufficient information for action.

2. Article published in FLIGHTFAX, Vol. 6, #2, 12 Oct 77, "It's That Time Again."

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
238	P	15 UH-1H pilot flying number five aircraft in a flight of seven on a tactical troop lift, performed a course of action that is prohibited by TM 55-1520-210-10, para 10-33. He attempted an approach to powder snow without a visual reference. As a result, he entered a whiteout condition, and became disoriented and lost control of the aircraft. The aircraft drifted left, the left skid contacted the ground, the main rotor struck the ground and the aircraft crashed.	2 UH-1H pilot performed a prohibited course of action (attempted landing to snow without a visual reference) because of inadequate unit training. Aviator was late arriving at the training area and was administratively grounded and then put back on flying status. The aviator and his copilot did not receive the limited training that was given the other pilots in the unit on landings and go-arounds in loose snow.	2 Unit commanders should upgrade unit training to insure all pilots are aware of special hazards associated with environmental conditions common to the geographical area of operations. In addition to quality of training, commanders should monitor program to insure that none of the pilots have missed the training. To implement this remedial measure unit commanders should use TRADOC training guides which detail different operational characteristics that must be considered for each specific geographic environment, "TC 1-12 "Cold Weather Flying Sense," dated July 1977, is an excellent training circular to aid unit commanders in upgrading unit training for cold weather operations.

CASE #238 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
238	P	15 UH-1H pilot flying number five aircraft in a flight of seven on a tactical troop lift, performed a course of action that is prohibited by TM 55-1520-210-10, para 10-33. While making an approach to powder snow he entered a whiteout condition with no reference and did not initiate a go-around. As a result, he continued his approach and became disoriented and lost control of the aircraft. The aircraft drifted left, the left skid contacted the ground and the main rotor struck the ground and the aircraft crashed.	2 UH-1H pilot performed a prohibited course of action (attempted landing to snow without a visual reference) because of inadequate unit training. Aviator was late arriving at the training area and was administratively grounded and then put back on flying status. The aviator and his copilot did not receive the limited training that was given the other pilots in the unit on landings and go-arounds in loose snow.	2 Unit commanders should upgrade unit training to insure all pilots are aware of special hazards associated with environmental conditions common to the geographical area of operations. In addition to quality of training, commanders should monitor program to insure that none of the pilots have missed the training. To implement this remedial measure unit commanders should use TRADOC training guides which detail different operational characteristics that must be considered for each specific geographic environment, TC 1-12 "Cold Weather Flying Sense", dated July 1977, is an excellent training circular to aid unit commanders in upgrading unit training for cold weather operations.
238	P	15 (Repeat)	2 (Repeat)	11 Higher command should improve monitoring of personnel and unit activities to insure aviation units are providing timely and adequate training for hazards associated with unit's operational environment. To implement remedial measure, OTIC should include this area of unit aviator training as an item of special interest during annual general inspection (AGI).

CASE #238 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
233	P	15 (Repeat)	2 (Repeat)	6 ASO's should inform personnel of problems encountered and remedies via meetings, publications and directive messages regarding hazards associated with hovering or landing in snow when appropriate to implement this remedial measure, USAAAVS should provide ASO's with related mishap information via FLIGHTFAX and AVIATION DIGEST.
238	FCO	11 UH-1H flight leader (platoon commander) improperly assigned personnel in violation of AR 95-5, para 5-4. He assigned two aviators to a mission which required operation in an environment (blowing snow) for which the aviators were not trained. As a result, the aviators became disoriented while landing in snow, lost control of the aircraft and crashed.	6 UH-1 flight leader improperly assigned personnel (assigned aviators to perform a mission in blowing snow in which they were not trained) because of inadequate judgment. He said that he considered earlier switching the two aviators where they would be with someone who had snow training but he did not do it.	5 Unit commanders should insure personnel are ready/capable of performing job assigned regardless of their training, experience or psychological state. When making mission assignments, personnel making the assignment (e.g., operations officers, platoon leaders, flight commanders) must consider the experience level and training of the personnel to perform the assigned mission so as to avoid overextending their capabilities. To assist commanders in gaining this expertise, TRADOC should insure the Aviation Commander's Readiness Course (COI 2GF15) includes instruction on crew selection and assignment.

CASE #238 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
238	FCO	11 (Repeat)	12 UH-1H flight leader improperly assigned personnel (assigned aviators to perform a mission in blowing snow in which they were not trained) because of command pressure. Witnesses state that there was command pressure on all commanders and pilots to get the job done.	11 Improve monitoring of unit/battalion/group personnel and unit/battalion/group activities by higher command (division and FORSCOM commanders) to insure that guidance provided by staff officers and commanders regarding performance of maneuver and training activities cannot be misconstrued so as to override sound operating principles each aviator is expected to employ in accomplishing assigned tasks. To implement this objective, TRADOC should insure that the Aviation Commander's Readiness Course (COI 2G-F15) includes instruction on recognizing how command guidance may be misconstrued to override sound operating principles and ways to guard against such misunderstanding.
239		No contributing materiel failure/ malfunction.		

CASE #239

Actions Completed

1. Unit level action.

2. Article published in FLIGHTFAX, Vol. 6, #8, 23 Nov 77, "Selected Mishap Briefs."

CASE #240

Insufficient information to perform a materiel failure/malfunction (FIRE) analysis. No contributing human error.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
239	P	9 UH-1H pilot on service ferry mission improperly monitored performance of equipment in contravention of common practice. After engine start and run up, he reduced throttle to establish an engine RPM of 5500 while awaiting a special VFR clearance. When another member of his flight indicated he was ready to go, the pilot, noting RPM was not at 6600, increased throttle, looked outside the aircraft, and looked back inside. He noted a rapid acceleration and immediately reduced throttle, believing he had experienced an N_2 governor overspeed. He then noticed the master caution light was illuminated and that the governor switch was in the EMER position. As a result, an engine overspeed to 7000-7100 RPM occurred for a duration of approximately one second.	5 UH-1H pilot improperly monitored performance of equipment (did not monitor and detect illumination of master caution light and isolate cause to governor switch being in EMER position prior to increasing throttle) because of inadequate attention. As he increased throttle to bring engine RPM up to 6600 in preparation for takeoff, he looked outside the aircraft momentarily instead of continuing to monitor RPM and caution panel indications.	6 USAAAVS should inform personnel of problems encountered and remedies concerning inadequate attention via FLIGHTFAX and Aviation Digest.
240		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
240		No contributing human error.		
241		No contributing materiel failure/ malfunction.		

Actions Completed

1. Safety of flight advisory message, USAAAVS, 161410Z Dec 77, subject: Use of Automatic Opening Devices in Conjunction With Sport Parachute Missions.

2. Safety of flight advisory message, USAAAVS GEN 78-2, 072100Z Apr 78, subject: Parachute Operations From UH-1 aircraft.

3. FLIGHTFAX article, Vol. 6, #11, 14 Dec 77, subject: "Parachute Automatic Opening Device."

4. FLIGHTFAX article, Vol. 6, #24, 5 Apr 78, subject: "Parachute Operation Hazards."

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
241	CE	15 UH-1H crewchief on a paradrop mission performed a course of action prohibited by common practice. During the descent after the paradrop, the crewchief unhooked the static lines with the parachute deployment bags from the anchor cable thus creating loose equipment in the aircraft while the cargo doors were open. Two of the deployment bags blew out of the aircraft and struck the tail rotor causing the 90 degree gearbox to separate from the aircraft. The aircraft crashed while making an emergency landing to a motor pool causing major (total) damage.	19 UH-1H crewchief performed a prohibited course of action (unhooked the static lines inflight) because of inadequate written procedures. Neither TM 55-1520-210-10 nor TM 57-220 contain instruction on when the static lines should be unhooked. Neither publication warns personnel of the hazards of performing this task while inflight.	3 TRADOC revise TC 1-135 (draft) task number 6008 to include instruction that requires the static lines remain secured to the anchor cable until after landing.
241	CE	15 (Repeat)	19 (Repeat)	3 TRADOC revise TM 57-220 to include instructions that require the static lines remain secured to the anchor cable until after landing.
242		No contributing materiel failure/malfunction.		

CASE #242

Actions Completed

On a routine basis FLIGHTFAX and AVIATION DIGEST contain articles dealing with the problems of inadequate division of attention.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
242	IP	8 The IP of an OH-58A misinterpreted an inflight aircraft action. While concentrating on a map, the IP allowed the SP to continue hovering the aircraft. The SP, unobserved by the IP, repositioned (hovered and turned) the aircraft into a 8-10 knot right quartering tailwind condition near a tree line. The IP resumed control of the aircraft and over-reacted to the unexpected tail wind condition which he misinterpreted as an antitorque failing. Fearing a tail rotor tree strike, the IP attempted to pivot the aircraft about the tail rotor away from the tree line. The aircraft developed a nose low attitude and IP responded with aft cyclic resulting in the aft skid and vertical stabilizer becoming stuck in the soft sod. As the aircraft continued to rotate, the tail boom flexed and allowed the tail rotor to strike the tail boom, severing the aft section. The IP reduced collective rapidly causing a hard landing.	5 The IP misinterpreted an aircraft action because of his inadequate division of attention. Due to his concentration on a map, the IP was not aware of the SP's repositioning of the aircraft to a tail wind condition near a tree line. When he reassumed control, the aircraft began a slow turn due to the tail wind which the IP interpreted as an antitorque failure and, due to the proximity of the trees, over-reacted causing the tail rotor to strike the ground.	6 USAAAVS inform personnel (school IP's) of the potential problems that may be encountered as a result of inadequate division of attention while working with students. Safety meetings and briefings should be used to stress the importance of IP's being constantly aware of SP actions and maneuvers while airborne.
242	IP	8 (Repeat)	5 (Repeat)	6 USAAAVS inform personnel of the problems that can be encountered due to inadequate division of attention. Articles published in safety publications should stress the importance of IP's continuous monitoring SP actions and airborne maneuver performance.
243		No contributing materiel failure/ malfunction.		

CASE #243

No action taken other than unit level.

CASE #244

Insufficient information for action.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
243	IP	16 UH-1H instructor pilot on training mission failed to perform a course of action required by common practice. During the student pilot's first flight in this series aircraft, the IP did not demonstrate (both by himself and with the student following through on the controls) takeoff to a hover. As a result, drift and yaw control deteriorated beyond the experience level of the SP. Corrective action by the IP was insufficient to prevent subsequent abrupt motions in all three axes of flight and main rotor impact with the ground.	14 IP performed a course of action prohibited by common practice due to habit interference. IP's most recent duties had been conducted with SP's at the 50-hour level of experience in the UH-1H.	2 USAAVNC upgrade unit training to insure IP's receive refresher training (i.e., checkride, commander's briefing) prior to duties with lesser experienced SP's.
243	IP	16 (Repeat)	14 (Repeat)	3 USAAVNC provide procedures for normal operations through unit SOP. Takeoff to a hover conducted for the first time will be preceded by IP demonstration and subsequent SP control follow-through prior to SP performance.
244		No contributing materiel failure/ malfunctions.		
244	P	7 UH-1H pilot on a service mission in support of tactical training applied improper flight control actions during takeoff to a hover from a downhill and crosshill slope. The pilot permitted, through excessive right cyclic application, the aircraft to exceed critical rollover characteristics as described in TM 55-1520-210-10, para 8-18. The aircraft rolled to the right and the main rotor blade impacted the ground.	2 Flight control actions were improperly applied due to inadequate unit training. Standardization flights did not include slope operations proficiency checks even though the unit provided such support on an occassional basis. At least eight years had elapsed since the pilot demonstrated proficiency in slope operations.	2 Aviation division provide unit training in slope operation techniques during standardization check rides. Discussion of UH-1H critical rollover characteristics be included.
245		No contributing materiel failure/malfunction.		

CASE #245

No action taken other than unit level.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
245	IP	10 UH-1H IP on a primary training mission improperly monitored performance of student pilot in violation of common practice. After assisting the SP in terminating and recovering from his first simulated anti-torque stuck pedal maneuver, he failed to insure that the SP had positioned his feet on the pedals prior to his (IP) release of the controls while hovering. When the SP realized that neither he nor the IP was controlling the pedals, he attempted to place his feet on them. This action (movement of the legs and resulting movement of right arm) resulted in full left pedal and right aft cyclic control input and the aircraft began yawing left nose high. The IP regrasped the controls and input forward cyclic and bottomed collective which resulted in a hard landing and mast bumping.	5 UH-1H IP improperly monitored performance of student pilot (failed to insure SP had his feet on the anti-torque pedals before relinquishing controls to him while hovering) because of inadequate attention. He assumed that the SP had taken pedal control and was engrossed in the critique of the SP's previous maneuver mistakes.	16 USAAVNC IP's improve monitoring of personnel (SP's) by insuring that instructions associated with non-standard maneuver training is countermanded verbally and visually checked when normal training procedures are resumed.
245	IP	10 (Repeat)	5 (Repeat)	1 USAAVNC upgrade school training by reinforcing the procedure that the IP be on the flight controls during critique of mistakes which the SP made on previous maneuver.

CASE #245 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
245	IP	10 (Repeat)	14 UH-1H IP improperly monitored performance of student pilot (failed to insure SP had his feet on the anti-torque pedals before relinquishing controls to him while hovering) because of habit interference. He assumed as normal that the SP would retake command of the pedal controls after the stuck pedal maneuver even though he (IP) had instructed the SP to keep his feet off the pedals and on the floor without countermanding these instructions.	16 USAAVNC IP's improve monitoring of personnel (SP's) by insuring that instructions associated with non-standard maneuver training is countermanded verbally and visually checked when normal training procedures are resumed.
245	SP	16 UH-1H SP on a primary training mission with an IP failed to perform a course of action required by common practice. After terminating and recovering to a hover from his first simulated anti torque stuck pedal maneuver, SP failed to place his feet on the pedals to control yaw at the hover. During the non-standard maneuver, the IP had instructed the SP to keep his feet off the pedals and on the floor (IP controlled pedals). During termination and recovery, the IP assisted the SP on the controls to a hover without taking command of the controls (no transfer of controls occurred), released the controls and commenced critiquing mistakes of the maneuver. When the SP realized no one was controlling the pedals, he attempted to place his feet on them. This action (movement of the legs and resulting movement of the right arm) resulted in full left pedal and aft cyclic control input and aircraft commenced yawing left nose high. The IP regrasped the controls and input forward cyclic and bottomed collective which resulted in a hard landing and mast bumping.	26 UH-1H SP failed to perform a course of action required by common practice (failed to place his feet on the pedals after termination of a stuck pedal maneuver) because of inadequate supervision/coordination by the IP. IP failed to countermand his instructions for the SP to keep his feet off the pedals when releasing the controls for the SP to hover.	16 USAAVNC IP's improve monitoring of personnel (SP's) by insuring that instructions associated with non-standard maneuver training is countermanded verbally and visually checked when normal training procedures are resumed.

CASE #246

No action, other than at unit/local level, being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
245	SP	16 (Repeat)	26 (Repeat)	6 USAAAVS inform personnel of problems encountered and remedies via publications in FLIGHTFAX.
246		No contributing materiel failure/ malfunction.		
246	P	15 OH-58A pilot on a training mission performed a course of action prohibited by FM 1-1. He engaged in contour flight without another qualified viator or a qualified aeroscout observer as required by FM 1-1, paragraph 1-5. After flying approximately 4 hours of a 6-hour training flight scheduled to "burn off" flying hour program time, the pilot elected to practice contour flight. This decision to practice contour flight alone is in contravention of the guidelines described in FM 1-1. As a result, the pilot, attempting to read a map on the CP seat and fly contour, did not observe a tree in his flight path in sufficient time to avoid striking it. The aircraft sustained major damage as a result of the tree strike.	25 OH-58A pilot performed a course of action prohibited by FM 1-1 (engaged in contour flight alone) because of inadequate supervision on the part of the platoon leader. The platoon leader assigned and approved a 6-hour, single pilot, training mission in order to meet a flying hour program without assigning the pilot training tasks to be accomplished during the flight IAW TC 1-137. Neither did the pilot's aircrew training manual records reveal any established task requirements or task completion records also IAW TC 1-137. As a result of the unstructured mission assignment, the pilot was placed in a position in which this type of decision-making error was likely.	2 Unit commander upgrade unit training. The unit commander should implement and enforce an effective unit training program to insure task requirements are established and their completion is monitored and recorded in each unit pilot's Aircrew Training Manual records IAW TC 1-137. An upgraded training program will assist in gaining maximum training benefits from the allocated flight training hours in the flying hour program.

CASE #246 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
246	P	15 (Repeat)	25 (Repeat)	12 Unit commander improve supervision of platoon leaders and platoon operations. The Unit commander should maintain cognizance of the platoon flight missions to insure missions are structured, planned and flown for maximum training benefit and to preclude the dispatch of unit aircraft to "burn" flight hour program time without training tasks to accomplish. The unit commander must also conduct frequent spot checks of unit training records to determine status of aviator training progress and record maintenance.
246	P	5 OH-58A pilot, on a training mission, improperly divided his attention (between a tactical map and the aircraft flight path). At 4.5 hours into a 6-hour training mission which was scheduled to meet a unit flying hour program, the pilot, while flying solo at contour altitudes, channelized his attention (for an estimated 5-second period) inside the cockpit in an attempt to orientate himself on a map laying in the left front seat of the aircraft. The aircraft made contact with the top of a tree and sustained major damage. The aircraft was landed at a training area in the immediate vicinity under full control.	2 OH-58A pilot improperly divided his attention because of inadequate unit training. As a result of this inadequate training, the pilot attempted tactical map navigation while flying solo at contour altitudes and struck a tree. The unit IP, under command pressure to expedite the checkout, signed off the pilot with less than the ten hours tactical training recommended by AR 95-1, para 2-5, and could not remember discussing applicable regulations such as FM 1-1, para 1-5, aircrew requirements for terrain flight. Neither did the requalification training cover NOE route planning or navigation. The pilot allegedly received NOE initial qualification with an operational unit in 1973 prior to his separation from service, though this training is not reflected in the individual's records.	2 Unit commander upgrade unit training. The commander should, through close monitoring and frequent spot checks, insure that all new unit pilots receive completed checkouts IAW the applicable regulations, directives, and SOP's prior to being released for unit missions or being designated AIC, and the records be maintained to reflect the accomplished training. The commander should also insure the IP has sufficient time to conduct the required training without undue pressure to expedite at the expense of the training program by proper scheduling of IP additional duties.

CASE #247

No action taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
246	P	5 (Repeat)	2 (Repeat)	11 Higher command improve monitoring of unit activities. Periodic inspections and spot checks would serve as incentives to complete unit qualifications and to properly maintain records. Higher command influence can be exerted to alleviate the pressures to shortcut qualification requirements.
247		23 UH-1H on a local service mission experienced an N_2 governor failure. At approximately 50 feet AGL, 60 KIAS, and in reduced power situation, the N_2 governor became inoperative. When the pilot increased collective, the engine and rotor RPM decreased and the pilot was forced to enter autorotation. The aircraft landed on rocky sloping terrain causing major damage.	30 UH-1H experienced an N_2 governor failure because rebuild of the N_2 governor was performed inadequately. The speeder spring was improperly shimmed by .013 inches causing the governor to malfunction. This condition caused the loss of RPM when the collective was increased.	3 DARCOM revise TB 55-1500-307-24 to require the N_2 governor be entered on the engine DA Form 2408-16 and submission of DA Form 2410 for replacement of the governor. This will aid TSARCOM in tracking governor problems.
247		23 (Repeat)	30 (Repeat)	11 DARCOM improve monitoring by assessing the quality assurance program at the present overhaul facility to ensure that the inadequacies (improper N_2 governor shimming) of the previous overhaul facility do not exist.
247		Insufficient information to perform a Human Error (TEIR) analysis.		
248		No contributing materiel failure/malfunction.		

CASE #248

Actions Completed

1. FLIGHTFAX article (Vol. 7, No. 6, 8 Nov 78), subject: "Discipline - Who Needs IT?".

2. See Case #224 for additional actions completed and in progress.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE OR MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
248	LCO	14 During a service mission in an OH-58A, the Brigade Executive Officer, the passenger in left front seat, authorized a course of action prohibited by directive (msg dated 2914322 Aug 75, subject: Operational Limits for Army National Guard Aircraft, para 2b) which prescribes a minimum operational altitude of 500 feet AGL. While having full knowledge of the aforementioned directive, he permitted the pilot to fly at such an altitude that he struck a power line suspended approximately 80'-100' above the surface of a river without questioning the pilot's actions. Minor damage to the aircraft resulted.	6 The Brigade Executive Officer, while a passenger, authorized the pilot of an OH-58A to fly below that minimum operational altitude prescribed by directive because of inadequate judgment. He was aware of the altitude restriction and observed the aircraft getting closer to the water without questioning the actions of the pilot, thereby authorizing the action, a display of judgment that was considered inadequate.	7 Command take positive command action to discourage improper performance by ensuring compliance with established regulations and written procedures.
248	LCO	14 (Repeat)	6 (Repeat)	6 Command inform subordinate Command and Staff personnel of problems encountered and remedies via Command/ Staff meetings.
248		14 (Repeat)	6 (Repeat)	7 Brigade take positive action to discourage improper performance by ensuring compliance with established regulations and written procedures.
248	P	15 OH-58A pilot on a service mission performed a course of action prohibited by directive which prescribes a mimimum operational altitude of 500 feet AGL. He was flying at such an altitude that he struck a power line suspended approximately 80'-100' above the surface of a river, resulting in minor damage to the aircraft.	6 OH-58A pilot performed a course of action prohibited by directive (flew the aircraft below the minimum operational altitude of 500' AGL prescribed) because of inadequate judgement. He was fully aware of the minimum 500' AGL restriction but elected to fly the aircraft, for no justifiable reason, at such an altitude that he struck a power line approximately 80'-100' above the surface of a river.	7 Command take positive command action to discourage improper performance by ensuring compliance with established regulations and written procedures.

Actions Completed

CASE #249

1. *FLIGHTFAX* article (Vol. 6, No. 24, 12 Apr 78), subject: "The One With the Tool Box."
2. FLIGHTFAX article (Vol. 6, No. 41, 2 Aug 78), subject: "OH-58 Torque Values Critical."

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
248	P	15 (Repeat)	6 (Repeat)	7 Brigade take positive command action to discourage improper performance by ensuring compliance with established regulations and written procedures.
249		23 OH-58A experienced a power plant fuel control malfunction (loose air tube assembly nut). During cruise flight at 1000 feet AGL and 90 KIAS over forested mountains, the engine lost power and RPM due to a loose nut (PN 6728015-4) on the accumulator end of the air tube assembly (PN 6854139) which connects the air accumulator to the fuel control governor reset pressure port. The loss of power resulted in an autorotation which terminated in a hard landing and major aircraft damage.	18 OH-58A experienced a power plant fuel control malfunction because of a loose nut (PN 6728015-4) which, it is suspected, resulted from improper torque during installation or subsequent maintenance on the governor/fuel control system by unidentified maintenance personnel. This loose nut caused the governor/fuel control system to respond to a false signal and reduce engine power to a flight idle condition that resulted in an autorotation which terminated in a hard landing and major aircraft damage.	
249		23 (Repeat)	18 (Repeat)	19 Unit commander improve monitoring of quality control personnel to insure maintenance actions are complete and thorough to include proper application of torque values.
249		23 (Repeat)	18 (Repeat)	6 USAAAVS publish articles in the various safety publications adding emphasis to the importance of proper torque procedures and thorough, by-the-book maintenance actions on the part of both the mechanic and quality control personnel.

CASE #250

Actions Completed

1. ATM discourages this type of takeoff except for emergencies or when the tactical situation dictates.

2. FLIGHTFAX article (Vol. 6, No. 26, 19 Apr 78), fixed wing mishap briefs, discussed the events of this mishap.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
249		No contributing human error.		
250		No contributing materiel failure/ malfunction.		
250	P	16 JRU-21D pilot on a service mission failed to perform a course of action required by the Technical Manual. During an attempted minimum run takeoff, the pilot failed to follow the procedures outlined in the Operator's Manual (TM 55-1510-209-10-1, para 8-23c). He selected an incorrect flap setting and either permitted or caused the aircraft to become airborne below the minimum airspeed required for full aircraft controllability. Due to the absence of aircraft control, the aircraft crashed and burned immediately after becoming airborne.	7 JRU-21D pilot failed to perform a course of action required by the Technical Manual because of over-confidence in himself. He was familiar with the prescribed procedures in the Operator's Manual but due to his years of aviation experience and over 1300 flight hours in this design and model aircraft, he was confident he could better perform the maneuver using a different (non-standard) procedure. He informed the investigating board he "did not use, had never used, and did not in the future plan to use" the procedures as set forth in the Operator's Manual for this procedure. His use of a "non-standard" procedure resulted in the loss of control as the aircraft became airborne and the resultant crash and destruction by fire of the aircraft.	7 Unit commander provide positive command action to discourage improper performance due to overconfidence. Implementation considerations should include a strong unit standardization program augmented by disciplinary action to encourage compliance with standard and proven procedures.

CASE #250

No action, other than at unit/local level being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
250	P	16 JRU-21D pilot on a service mission failed to perform a course of action that is required by the Technical Manual. Prior to attempting a minimum run takeoff, the pilot failed to properly plan his flight (prepare a performance planning card) IAW TM 55-1510-209-10-1. As a result, he was not aware of the required versus the available aircraft performance capabilities involved in the attempted minimum run takeoff maneuver. The aircraft crashed and burned immediately after becoming airborne with improper flap settings and airspeed below that required for aircraft control.	7 JRU-21D pilot failed to perform a course of action (prepare a performance planning card)required by the Technical Manual because of overconfidence in himself. He was familiar with the Technical Manual requirements but due to his years of aviation experience and over 1300 flight hours in this designated model aircraft, he considered himself sufficiently knowledgeable of the aircraft capabilities to warrant disregarding the normal flight planning procedures. As a result, the aircraft became airborne with incorrect flap settings and at an airspeed below that required for aircraft control. The aircraft crashed and burned.	7 Unit commander provide positive command action to discourage improper performance due to overconfidence. Implementation considerations should include a strong unit standardization program that emphasizes "by-the-book" flight planning and augmented by disciplinary action to encourage compliance with required procedures.
251		No contributing materiel failure/ malfunction.		

CASE #251

No action, other than at unit/local level, being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
251	P	15 OH-58A pilot on an unsupervised individual training mission performed a course of action not in accordance with TM 55-1520-228-10 para 26 and AR 95-1 para 3-3 and 1-8. The pilot attempted a right turn at a low altitude (75 feet AGL) using a bank angle of 60 degrees. The Board considers this an abnormal attitude since it is not necessary for normal flight. He unnecessarily placed himself and the aircraft near their safe limits. As a result, the angle of bank increased beyond 60 degrees to approximately 90 degrees resulting in a high rate of descent. The pilot was able to level the aircraft just before impact but he could not arrest the rate of descent.	19 OH-58A pilot performed a course of action prohibited by TM and AR (Steep turn not necessary for normal flight) because of inadequate written procedures. Although the Board has referenced written restrictions that prohibit the pilot's attempted steep turn, these restrictions are ambiguous and are subject to individual interpretation.	3 DARCOM should revise TM 55-1520-228-10 to include more specific guidance on prohibited maneuvers. Specific bank angles and pitch attitudes should be included.
251	P	15 (Repeat)	22 OH-58A pilot performed a course of action prohibited by TM and AR (steep turn not necessary for normal flight) because of inadequate supervision by the unit commander. The pilot stated he had used these steep turns many times in the past, and he felt 60 degree turns were a normal procedure in the unit. It is the opinion of the Board that the pilot "learned" this maneuver from other unit aviators since this was his first assignment since flight school. The unit commander apparently was unaware of how certain pilots were operating unit aircraft.	12 Company commander should improve monitoring of personnel. One method of doing this would be to require two pilots on missions, whenever possible. Training missions should also be assigned with specific tasks for the pilots to accomplish.

CASE #251 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
251	P	15 (Repeat)	6 OH-58A pilot performed a course of action prohibited by TM and AR (steep turn not necessary for normal flight) because of inadequate judgment. Although the Board suspects the pilot "learned" this maneuver from other pilots and the pilot stated he had successfully done 60 degree banks before, the Board feels it was poor judgment for the pilot to attempt the maneuver at such a low altitude, especially with an aircraft restricted from low flight because of an increased probability of engine failure.	6 Company commander should inform unit aviators of the hazards associated with steep turns at low altitudes. A safety meeting on the circumstances of this mishap would be one method of accomplishing this.
251	P	7 OH-58A pilot on an unsupervised individual training mission made an improper flight control action. While attempting a right bank of 60 degrees the pilot "allowed" the aircraft to roll into a 90 degree bank, resulting in a high rate of descent. This probably was caused by excessive lateral cyclic or lateral cyclic held for too long, causing the roll to continue past 60 degrees. The pilot was able to level the aircraft just prior to impact but he could not arrest the rate of descent.	5 OH-58A pilot made an improper flight control action (excessive lateral cyclic) because of inadequate attention. The Board suspects the pilot looked away from his visual reference long enough to allow the bank angle to exceed 60 degrees. He did not indicate he had actually observed the right roll progress through 60 degrees to the 90 degree point. Instead he seemed to indicate that he suddenly became aware of the 90 degree bank.	2 Company commander should provide unit training to improve aviator attention. The importance of proper attention to visual references at all times, especially during turns, should be stressed.
252		No contributing materiel failure/ malfunction.		

CASE #252

Actions Completed

1. FLIGHTFAX article (Vol. 6, No. 47, 13 Sep 78), subject: "OH-58A Tail Rotor Stall."

2. AVIATION DIGEST, Oct 1978, subject: "Hover Power Check."

3. USAAAVS message 241925Z Oct 78, subject: Safety of Flight Advisory - Inadequate Tail Rotor Thrust in OH-58A aircraft.

4. USAAAVS message 302203Z Oct 78, subject: Category I EIR - OH-58A Tail Rotor, recommended that the OH-58A tail rotor be reevaluated to determine timely solutions for the design deficiency. The second recommendation addressed the inadequacy of the OH-58A Operator's Manual with regard to warnings, emergency procedures, etc., as they apply to the tail rotor problem. TSARCOM message 201415Z Nov 78, subject as above, concurs with USAAAVS recommendations.

Actions in Progress

USAAVNC message 082300Z Dec 78, subject: OH-58C Materiel Release, recommended that operational release of the OH-58C be contingent upon continued efforts to improve its directional control.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
252	P	15 OH-58A pilot on a service ferry mission performed a course of action prohibited by common practice. After refueling and then proceeding inflight 15 minutes on the last leg of a ferry flight to a tactical LZ, the pilot, who was in the trail aircraft of a flight of three, was first to sight the LZ and he informed the other members of the flight of its location. He then brought his aircraft to a 50-60 foot hover, at near gross weight, OGE, in a 10-20 knot tailwind and initiated a pedal turn to the right which he was unable to stop. The aircraft continued to rotate 1½-2 turns to the right and the pilot, thinking he had tail rotor failure, closed the throttle and attempted an autorotation. As a result, because the aircraft was operating within the avoid area of its height/velocity diagram at the time, a hard landing became inevitable and the aircraft sustained major damage upon touchdown.	6 OH-58A pilot performed a prohibited course of action (attempted to hover and turn aircraft at near its gross weight, OGE, in a tailwind) because of inadequate judgment. Once the pilot had identified the destination LZ and had informed the other members of the flight of its location, neither the flight mission nor the circumstances dictated that he bring the aircraft to an OGE hover. Regardless, he chose this course of action in lieu of maintaining a safe airspeed or otherwise modifying his flight path to maintain the integrity of the formation.	6 Unit ASO's should inform personnel of problems encountered and remedies via safety meetings regarding inadequate judgment. To implement remedy, USAAAVS provide ASO's with related information upon request.
252	P	15 (Repeat)	9 OH-58A pilot performed a prohibited course of action (attempted to hover and turn aircraft at near its gross weight, OGE, in a tailwind) because of overconfidence in the performance capabilities of the OH-58A aircraft. When questioned as to his previous experience in hovering at 50 feet, he indicated that he had done it several times and did not consider it a dangerous maneuver.	6 Unit ASO's inform personnel of problems encountered and remedies via safety meetings regarding aviator overconfidence in aircraft performance. To implement remedy, USAAAVS provide ASO's with related information upon request.

CASE #252 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
252	P	15 (Repeat)	11 OH-58A pilot performed a prohibited course of action (attempted to hover and turn aircraft at near its gross weight, OGE, in a tailwind) because he lacked confidence in himself. When flight lead directed the pilot to take over lead so the others could follow after he sighted the destination LZ, the answered in the negative, stated he would keep the LZ in sight, and directed the others to go around him.	6 Unit ASO's inform personnel of problems encountered and remedies via safety meetings regarding lack of self-confidence. The assistance of specialty trained personnel such as a flight surgeon should be solicited to address the roles psycho/physiological factors play in accident causation. To implement remedy, USAAAVS provide ASO's with related information upon request.
252	P	8 OH-58A pilot on a service ferry flight misinterpreted a self-induced inflight condition (exceeding left pedal tail rotor authority) as a failure of the tail rotor system in contravention of the information implied but not clearly stated by para 8-2, TM 55-1520-228-10. After refueling and then proceeding in flight 15 minutes on the last leg of a ferry flight to a tactical LZ, the pilot was the first in his flight to sight the LZ. He informed the othermembers of the flight of its location, subsequently elected to bring his aircraft to a 50-60 foot hover at near gross weight, OGE, in a 10-20 kt tailwind and then initiated a pedal turn to the right. When he was unable to stop the right turn and the aircraft continued to rotate 1½-2 turns to the right, he thought he had a tail rotor failure, closed the throttle and attempted an autorotation. As a result, because the aircraft was operating well within the avoid area of its height/velocity diagram at the time, a hard landing became inevitable and the aircraft sustained major damage upon touchdown.	5 OH-58A pilot misinterpreted a self-induced condition causing loss of left pedal tail rotor authority as failure of the tail rotor system (thought he had a tail rotor failure because he couldn't stop a right turn, initiated at a high OGE hover downwind in a near gross weight condition) because of inadequate attention. When he elected to slow the aircraft to a hover and turn to the right so he could see the other two aircraft in the flight and keep the LZ in sight, the pilot stated that when he stopped the aircraft and waited for the other two aircraft to reposition, he was "showing the crewchief on the map where they were" and he was "trying to give him a little bit of training, so I had more than just the aircraft on my mind." Accordingly, he was not paying attention to the fact that he was placing the aircraft in a state of marginal performance conditions relative to its design tail rotor authority and when he attempted to stop the right turn, he misinterpreted the failure of opposite pedal to stop the turn as a tail rotor failure.	6 Unit ASO's inform personnel of problems encountered and remedies via safety meetings regarding inadequate attention. To implement remedy, USAAAVS provide ASO's with related information upon request.

CASE #253

No action, other than unit/local level, being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
252	P	8 (Repeat)	19 OH-58A pilot misinterpreted a self-induced condition causing loss of left pedal tail rotor authority as a failure of the tail rotor system (thought he had tail rotor failure because he couldn't stop a right turn initiated at a high OGE hover, downwind, in a near gross weight condition) because of inadequate written procedures for operation in normal man-machine-environmental conditions. The Operator's Manual (TM 55-1520-228-10) for the OH-58A aircraft is inadequate in cautioning operators about conditions of flight that can result in loss of tail rotor authority.	3 DARCOM take steps to revise procedures for normal operations in TM 55-1520-223-10. To implement remedy, chapter 4 should address steps to take if inadequate tail rotor authority is encountered while hovering below or above 10 feet. The information contained in figures 14-4, 14-7, 14-8, and 14-9 should be combined and a caution area added to show when left pedal authority can be exceeded in relation to 0-35 kt wind conditions.
253		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
253		Insufficient information to perform a human error (TEIR) analysis.		
254		23 OH-58A aircraft experienced a engine (fuel control) malfunction. While at 4500' AGL, 90 K straight and level flight at dusk, the Pc airline (PN 6850900) broke causing partial loss of engine power. Aircraft was autorotated to a field and sustained major damage on impact.	30 OH-58A Pc airline broke because it was improperly manufactured by G.S. Level Maint. (Field Maint.). The line was "eyeball" bent from an existing sample line and not IAW established procedures. This caused the line not to fit correctly and require a preload for alignment. This set up a stress concentration at one bend and caused the ultimate failure.	3 TSARCOM provide specific bending and manufacturing instructions for all lines when they authorize local manufacture.

Actions Completed

1. USASC has communicated this problem to TSARCOM. TSARCOM has established procedures to preclude this type of improper parts manufacture in the future. Reference TSARCOM letter, subject: Field Manufacture of Those Parts Normally Requisitioned, 9 Jun 78, states that TSARCOM will respond to requests for field manufacture when such requests are received through proper channels. TSARCOM evaluation of requests includes determining if the part in question is in supply channels, requestor ability to manufacture part with regard to expertise, materiels and drawings.

2. FLIGHTFAX article (Vol. 6, No. 37, 5 Jul 78), subject: "Check Your Parts Manual."

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
254		23 (Repeat)	18 OH-58A Pc airline broke because it was improperly installed by General Maintenance. When the line failed to align properly the mechanic forced the line in place setting up a pre-load stress concentration at one bend which caused the ultimate failure.	12 Unit commander insure by-the-book maintenance IAW TM 55-2840-231-24, page 5-3, para 5-5, which required hand bending or machine rebending for improperly fitting lines.
254	GM	16 Manufacturing/Rework personnel (MFP) general mechanic improperly performed a course of action required by common practice. He failed to properly manufacture the Pc airline IAW approved procedures. He used an old line as a sample and "eyeball" aligned the bends and twists to match the sample line. This resulted in the finished line being 1/2" to 3/4" off at one end. In order to be installed, the line required pre-load which set up a stress concentration at one end resulting in the ultimate in-flight failure with autorotative landing and major damage to the aircraft.	19 MFP general mechanic improperly performed the manufacture of the Pc airline because of inadequate written procedures. TSARCOM did not give specifications on bend angles and roll rates for this line when approved to be manufactured by Field Maintenance Unit.	3 TSARCOM provide specifications for local manufacture of special case lines when such authorization is given.

CASE #254 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
254	MS	3 Maintenance Supervisor (MS) acting as engine mechanic improperly performed required maintenance on OH-58A aircraft. He failed to properly install the Pc airline IAW TM 55-2840-231-24, page 5-3, para 5-5 (Rigid Tube Inst). The line should have been hand bent to final fit or machine rebent to fit without any pre-load. When this line failed to line up, the mechanic forced the nut in place setting up a pre-load situation. This pre-load caused a stress concentration at one bend, resulting in the ultimate in-flight failure with autorotative landing and major damage of the aircraft.	21 MS (acting as an engine mechanic) improperly performed required maintenance (improperly installed line) because of inadequate coordination by higher command. The G.S. Maintenance Unit is being filled with inexperienced personnel direct from school, unit authorized E-4 and E-5 slots are being filled with E-1 and E-2s, and the unit is critically short on E-7 maintenance supervisors. This caused the MS to perform the duties he would normally supervise.	8 Inf Div provide proper personnel (number and qualifications) to G.S. Maintenance Unit to insure unit can properly perform its mission.
254	MS	3 (Repeat)	3 MS (acting as engine mechanic) improperly performed required maintenance (improperly installed line) because of inadequate recent experience. The Maintenance supervisor's past experience was with hydraulic lines which are aluminum and not as critical to pre-loading. He used these same skills to install the steel Pc line which caused a pre-load condition with associated stress concentration and ultimate failure.	12 Improved monitoring of personnel and unit activities by unit commander in order to detect inadequate experience in critical areas. The unit CO should ensure that individuals' experiences are used to enhance unit mission.
255		No contributing materiel failure/ malfunction.		

CASE #255

No action, other than at unit/local level, being taken.

CASE #256

Actions Completed

FLIGHTFAX article (Vol. 6, No. 33, 7 Jun 78), fixed wing mishap briefs, discussed events of this mishap.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
255	P	15 OH-58A pilot on a tactical recon mission performed a course of action prohibited by common practice. While returning from his mission he made a left turn at 80 knots and 5-10 feet AGL. As a result, the main rotor blades struck the ground and the aircraft crashed sustaining total damage.	6 OH-58A pilot performed a prohibited course of action (failed to maintain terrain clearance) because of inadequate judgment. Though the tactical situation did not dictate this type of performance, he continued flight at a speed and altitude which did not allow for any error in judgment of terrain clearance.	7 Unit commander take positive action to discourage poor judgment when the pilot selects unnecessary high speed, low level terrain flight when the mission or situation does not require such flight.
256		No contributing materiel failure/ malfunction.		
256	P	16 T-42A pilot on service mission improperly performed a course of action required by common practice. When the aircraft began to porpoise and bounce during landing, he belatedly added power after the second bounce to effect a go-around. When the aircraft momentarily became airborne again to a height of 5-10 feet above the runway, the pilot, believing the landing had deteriorated beyond a point where a safe go-around could be accomplished, reduced power. As a result, the aircraft descended to the runway nosewheel first with sufficient force to overstress the structural integrity of the nosegear and cause major damage to the aircraft.	6 The pilot improperly performed a course of action required by common practice (belatedly added power to effect a go-around but then reduced power when aircraft was 5-10 feet above runway) because of inadequate judgment. When questioned as to what he would have done differently in retrospect, he stated that he would have added power as soon as the aircraft bounced the first time. He added, however, that if he thought the aircraft didn't have sufficient airspeed to fly, he would reduce power and try to hold the nose of the aircraft off the runway.	6 ASO's inform personnel of problems encountered and remedies regarding inadequate judgment via safety meetings. The expertise of specialty trained personnel such as a flight surgeon should be used to address the roles human factors play in accident causation. To assist in the implementation of this remedy, USAAAVS provide ASO's with related information upon request.

CASE #256 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
256	P	16 (Repeat)	6 (Repeat)	6 USAAAVS inform personnel of problems encountered and remedies regarding inadequate judgment associated with this and similar mishaps via FLIGHTFAX and/or Aviation Digest.
256	P	16 (Repeat)	6 (Repeat)	5 Unit CO's insure personnel (T-42A qualified aviators) are capable of performing job assigned regarding their training, experience or psycho/psysiological state. To implement remedy, unit SIP's/IP's should evaluate aviator judgment and skill in properly handling landings involving bouncing and porpoising as an area of special interest during standardization rides.
256	P	16 (Repeat)	1 The pilot improperly performed a course of action required by common practice (belatedly added power to effect a go-around but then reduced power when aircraft was 5-10 feet above runway) because of inadequate school training. Current T-42A transition training does not include mandatory instruction in how to cope with bouncing and/or porpoising landings.	1 TRADOC should direct USAAVNC to upgrade school training to include mandatory instruction in how to cope with bouncing and/or porpoising landings.
257		No contributing materiel failure/ malfunction.		

CASE #257

Action Completed

Article published in AEROMEDICAL, "Aspects of Aviation Safety."

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
257	P	1 UH-1H pilot on an aerial resupply mission performed inadequate pre-flight planning. Although the aircraft was loaded in an other-than-normal manner, the pilot did not perform a weight and balance computation (DD Form 365F) as is required by para 1d(1), AR 95-16, and para 4-1(j), AR 95-1. He also failed to consult the performance charts in the Aircraft Operator's Manual in accordance with TM 55-1520-210-10, para 3-4b. As a result, the aircraft was overgross and exceeding center-of-gravity limitations. Consequently, when the pilot aborted an approach when the aircraft fell through at 20 knots and 150 feet AGL, there was insufficient power and control authority available to successfully accomplish a go-around. The aircraft struck trees, followed by terrain impact, post-crash fire, and the total loss of the aircraft.	26 UH-1H pilot performed inadequate preflight planning (failed to compute performance requirements; failed to compute weight and balance for an abnormally loaded aircraft) because of inadequate monitoring by IP/SIP. Although training provided by extra unit sources was satisfactory from a regulatory standpoint, supervision and monitoring of aviation seciton pilots as set forth by AR 95-63, paras 1-10 and 1-11, were non-existent. As a result, a general decline in basic aviation skills occurred as is evidenced by the pilot improperly computing the DD Form 365F for the aircraft at maximum gross weight for the historical records and by his filing an improper flight plan.	8 EUSA provide proper personnel. The standardization instructor pilot required by the unit's modified table of organization and equipment (MTOE 07042HP803, para 108, line 16) should be authorized. This authorization would permit continuous monitoring and training of unit aviators by an instructor pilot.
257	P	1 (Repeat)	6 UH-1H pilot performed inadequate preflight planning (failed to compute performance requirements; failed to compute weight and balance for an abnormally loaded aircraft) because of inadequate judgment. Although 21 "mermite" food containers, 18 cases of soda, and 3 passengers were added to an aircraft equipped with a command console, the pilot did not suspect that it might be overgross and out of center-of-gravity limitations.	2 Upgrade unit training to provide more emphasis on all aspects of preflight planning, especially weight and balance computation and use of performance charts. Such training will enhance aviator judgment. This remedy can be implemented by scheduling classes on preflight planning for unit aviators.

CASE #257 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
257	P	1 (Repeat)	6 (Repeat)	6 Unit Aviation Safety Officers inform personnel of problems encountered as a result of inadequate judgment and their remedies via safety meetings. To implement this remedial measure, USAAAVS develop and provide ASO's with judgment related information.
257	P	1 (Repeat)	6 (Repeat)	12 Unit commander improve monitoring of personnel and unit activities to detect and resolve psycho/physiological problems prior to them adversely affecting aviator performance and compromising mission accomplishment. This remedial measure can be implemented by TRADOC insuring that the Aviation Commander's Readiness Course (CO 12G-F15), and related courses, include monitoring techniques for personnel and unit activities as a training objective.
257	P	1 (Repeat)	13 UH-1H pilot performed a prohibited course of action (failed to compute performance requirements; failed to compute weight and balance for an abnormally loaded aircraft) because of chronic fatigue. Conditions at the pilot's duty station are such that limited recreational facilities, long duty hours, prolonged standby, and isolation are conducive to long-term fatigue and its associated acceptance of lowered standards, narrowed span of attention and tendency to cut corners.	10 EUSA provide required facilities and services by making available activities at this duty station which reduce the effects of fatigue associated with small units in remote locations.

CASE #257 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
257	P	15 UH-1H pilot on an aerial resupply mission performed a course of action prohibited by common practice. When his aircraft began to fall through on approach to a confined area at approximately 20 knots and 150 feet AGL, the pilot turned downwind with winds at 12 knots gusting to 20 knots and towards climbing terrain to attempt a go-around. Although the aircraft was not climbing, due to the downwind turn combined with overgross and out-of-CG conditions, the pilot maintained 40 pounds of torque when 50 pounds were available until after the aircraft struck a tree. As a result, the aircraft lost the 90 degree gearbox and descended into the trees causing its total loss.	6 UH-1H pilot performed a prohibited course of action (attempted a downwind go-around into climbing terrain; did not use max power available to preclude tree strike) because of inadequate judgment. The pilot had not planned an alternative course of action for an aborted approach nor did he perceive that he was in trouble until after the first tree strike. When questioned as to what in retrospect he might have done to preclude the mishap, the pilot replied, "Nothing."	12 Unit commanders improve monitoring of personnel and unit activities to detect and correct psycho/physiological deficiencies before they adversely affect aviator performance and the successful accomplishment of the unit mission. This remedial measure can be implemented by TRADOC insuring that such courses as the Aviation Commander's Readiness Course (CO 12G-F15) include monitoring of personnel and unit activities as training objectives.
257	P	15 (Repeat)	6 (Repeat)	6 Unit Aviation Safety Officer inform personnel of problems encountered as a result of inadequate judgment and their remedies via safety meetings. To implement this remedial measure, USAAAVS develop and provide judgment-related material to ASO's.
257	P	15 (Repeat)	9 UH-1H pilot performed a prohibited course of action (attempted a downwind go-around into climbing terrain; did not use maximum power available to preclude the tree strike) because of overconfidence in the performance capabilities of the UH-1H aircraft. Although the pilot was aware of wind direction, the nature of the surrounding terrain, and that his aircraft was "heavy", he at no time doubted its ability to perform the maneuver.	6 Unit Aviation Safety Officers inform personnel of problems encountered as a result of overconfidence in equipment and their remedies via safety meetings. To implement this remedial measure, USAAAVS develop and provide ASO's with information related to overconfidence in equipment.

CASE #258

No action taken other than unit level.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
257	P	15 (Repeat)	9 (Repeat)	12 Unit commanders improve monitoring of personnel and unit activities to detect and resolve psycho/physiological problems prior to their having an adverse effect upon aviator performance and mission accomplishment. This remedial measure can be implemented by TRADOC insuring that courses such as the Aviation Commander's Readiness Course (CO 12G-F15) include monitoring techniques for personnel and unit activities as training objectives.
258		No contributing materiel failure/ malfunction.		
258	IP	10 UH-1H IP conducting contact training in the IERW Course improperly monitored performance of personnel (SP). While conducting a pinnacle operation, the SP terminated his approach to the pinnacle too far aft on the landing surface contrary to procedures prescribed in para 3-18d, IERW FTG (Sep 77). This resulted in the rear portion of the skids not being on the pad/pinnacle. The IP was not aware of this deficiency in the SP's selected touchdown point. As a result, when the collective pitch was lowered, the aircraft slid rearward off the pinnacle. The IP was unable to recover control of the aircraft, and the aircraft became a total loss.	5 UH-1H IP improperly monitored performance of personnel (not aware the SP had selected a touchdown point where the rear portion of the skids were off the landing pad) because of inadequate attention. Since the IP has sufficient experience to be familiar with the relative location of the skids, he was not paying adequate attention during the maneuver or he would have realized the skids were partially off the pad. The IP apparently thought the SP was terminating to a hover, and his attention may have been diverted when he instructed the SP to continue to the ground.	6 USAAVNC should inform personnel of the problems caused by inadequate attention. This could be accomplished by disseminating the facts and the circumstances surrounding this accident to all USAAVNC IP's.

CASE #259

Actions Completed:

TSARCOM message 051345Z Jul 78, AH-1-78-11 and UH-1-78-5, subject: Safety of Flight, Urgent With Limitations, One-Time Inspection of Tail Rotor Control (Silent) Chain. All dark colored chains were purged from the system.

Actions in Progress:

Silent chains will be eliminated when aircraft is modified to AH-1S.

CASE #260

Insufficient information to perform a materiel failure/malfunction (FIRE) analysis. No contributing human error.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
259		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
259		No contributing human error.		
260		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
260		No contributing human error.		
261		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		

CASE #261

Insufficient information for action.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
261	P	16 UH-1H pilot, on a service mission, improperly performed the emergency procedures for "underspeeding N_2 Governor (Low RPM)" as prescribed by para 4-33, TM 55-1520-210-10 w/C 19, dated 25 Aug 71. When the low RPM warning light and audio activated, the pilot entered autorotation, but failed to select a suitable forced landing area. As a result, the aircraft was landed power off in the trees causing major (total) damage to the aircraft and severe injuries to personnel.	14 UH-1H pilot improperly performed an emergency procedure because of habit interference. The pilot diagnosed the problem correctly, but because in performing his civilian job as instrument instructor pilot, he selected a forced landing area later in the emergency sequence, his instinctive reaction precluded early selection of a forced landing area, and caused him to focus attention inside the aircraft. As a result, when he realized he was having difficulty in coordinating the regaining of control, he was too low to select a safe landing area.	5 Aviation section commander ensure personnel are ready/capable of performing assigned tasks to include emergency procedures, training and memorization of those emergency actions which must be accomplished without delay.
261	P	16 (Repeat)	14 (Repeat)	6 Unit inform personnel of problems encountered and remedies via unit safety meetings and command aviation safety publications.
261	P	16 (Repeat)	14 (Repeat)	12 Unit commander improve monitoring of personnel to insure no assigned personnel are hampered in flight procedures by negative habit interference. Unit commanders should implement this measure through use of IP/SIP. During standardization checkrides, IP/SIP should place extra emphasis on any and all procedures which might be influenced negatively by the evaluated pilot's full time civilian job.

CASE #262

No action taken other than unit level.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
261	P	16 UH-1H pilot, on a service mission, improperly performed the emergency procedures for "Underspeeding N_2 Governor (Low RPM)" as prescribed by para 4-33, TM 55-1520-210-10 w/C 19, dated 25 Aug 71. After placing the selector switch in the emergency governor mode, he failed to apply sufficient collective to prevent the engine RPM from exceeding "red line." As a result, the aircraft yawed, made a grinding noise, and vibrated, causing him to abandon his attempt to regain flight. The aircraft was landed power off in the trees causing major (total) damage to the aircraft and severe injuries to personnel.	4 UH-1H pilot improperly performed emergency procedures because of inadequate composure. While pilot attempted to slowly increase throttle with governor selector switch in emergency position, the aircraft experienced engine surge strong enough to cause a yaw, grinding noise, and vibrations. These symptoms disturbed his presence of mind and caused him to think the aircraft was going to come apart in the air. As a result, he was induced to reenter autorotation even though the engine was operating normally.	5 Insure personnel are ready/capable of performing job assigned regarding their training, experience, or psycho/physiological state. Prior to assigning an aviator to a flight duty position of increased responsibility, the unit commander must insure the individual is ready/capable as stated above. This task could best be performed by the unit IP/SIP on an evaluation flight. All aviators could be placed in a controlled stress-producing situation, and their reactions could be evaluated.
262		33 UH-1H on training flight during unit ARTEP experienced a malfunction in the torque indicating system. Although the total weight was 10,259 pounds, the aircraft performed a five-foot hover using approximately 42 PSI torque instead of 45 PSI. As a result, the torque "GO-NO-GO" indicated a "GO". The aircraft departed the pickup site, lost RPM and landed hard causing major damage.	19 UH-1H experienced a malfunction in the torque indicating system (indicated 42 PSI instead of 45 PSI) because written maintenance procedures are inadequate. TM 55-1520-210-20 does not require the torque system be calibrated on a periodic basis. This allowed the malfunction to go undetected. Since the torque gauge is used as the sole power instrument, the variance of $\pm$ 10 PSI of applied pressure at a gauge reading of 100 PSI is considered unacceptable.	3 DARCOM revise TM 55-1520-210-20 to include indicating system calibration check during scheduled maintenance inspections. In addition, the allowable error must be eliminated or reduced.

CASE #262 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
262		23 UH-1H experienced a malfunction of the engine (fuel control). During a terrain takeoff with airspeed less than ETL and altitude less than 50 feet AGL, the engine fuel control malfunctioned because it was not properly adjusted. The maximum torque available was approximately 46 PSI instead of 49 PSI. As a result, engine N_2 RPM decreased when the pilot "demanded" more power than the engine could produce. The pilot attempted an emergency landing and the aircraft landed hard causing major damage.	19 UH-1H engine (fuel control) malfunctioned (was not trimmed to develop required torque) because maintenance personnel followed inadequate written procedures for normal operations. TM 55-2840-229-24, para 5-71 does not contain sufficient instructions to insure that during periods of cold weather, aircraft requiring a TEAC are airworthy (develop required power) prior to release for operational missions.	18 DARCOM (TSARCOM) perform a study to determine a solution to system inadequacy. The following are possible solutions which could be considered: (1) ground aircraft (red X) requiring baseline TEAC, (2) place operational restrictions (circle red X) on aircraft requiring baseline TEAC, (3) extend power adjustment chart above 10,000 feet (AR 95-1 revision and/or oxygen required), and (4) develop test equipment or methods which would allow the TEAC to be completed at lower density altitudes.
262	P	1 UH-1H pilot on a unit training mission (ARTEP) performed inadequate flight planning in violation of TC 1-135 (draft), page B-90. The pilot incorrectly computed the takeoff condition (corrected weight) on the DD Form 365F. He used 210 pounds per combat troop instead of 240 pounds as referenced in TM 55-405-9, para 42. In addition, the basic weight of the aircraft was in error. As a result, he attempted a terrain takeoff with the aircraft over gross weight limitations. RPM bled off during the takeoff, and the aircraft landed hard causing major damage.	2 UH-1H pilot performed inadequate flight planning (incorrectly completed the DD Form 365F) because of inadequate unit training. Neither the pilot nor the unit IP were familiar with TM 55-405-9, para 42. If adequate unit training on task 3001 (TC 1-135) had been conducted, both individuals would have known of the requirement to use 240 pounds per combat troop and where this requirement was specified.	2 Unit commander upgrade unit training on TC 1-135, task 3001 to insure aviators are familiar with TM 55-405-9.

CASE #262 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
262	P	1 (Repeat)	19 UH-1H pilot performed inadequate flight planning (incorrectly completed DD Form 365F) because of inadequate written procedures for normal operations. TM 55-1520-210-10 does not contain specific instructions on a planning weight for a combat troop. It does list 220 pounds per troop in the Typical Service Loading Chart (Chart 12-2) which is inadequate for a combat equipped troop. Since the -10 contains instructions on completing the DD Form 365F, aviators normally do not use TM 55-405-9 when performing this task.	3 DARCOM revise TM 55-1520-210-10 to specify an adequate planning weight for a combat equipped troop. If necessary, TM 55-405-9 should also be revised to contain this same figure (240 pounds may not be sufficient).
262	P	1 (Repeat)	22 UH-1H pilot performed inadequate flight planning (incorrectly completed the DD Form 365F) because of inadequate supervision by the unit commander. The pilot was assigned a mission that was well beyond the capability of the aircraft. He doubted his own judgment and was easily convinced to use a lower weight on the DD Form 365F since the other pilots in the platoon were also using this low figure. It is the commander's responsibility "to insure that mission and aircraft assignments are within aircrews' current capabilities." (AR 95-5, para 3-1f).	3 Unit commander revise procedures for normal operations in the unit SOP. The unit SOP should be revised to insure that the aircraft and an aircrew's current capabilities are compatible with the mission assignments. One method of doing this would be to establish maximum ACL's for each MDS aircraft. This ACL should be compatible with the heaviest aircraft of that MDS in the unit.

CASE #262 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
262	P	1 (Repeat)	22 (Repeat)	11 Unit commander should improve monitoring of his unit's activities to insure guidance from higher command is complied with, i.e., ACL's are established.
262	P	1 (Repeat)	26 UH-1H pilot performed inadequate flight planning (incorrectly completed the DD Form 365F) because of inadequate supervision by the unit IP/SIP. The IP advised the pilot to plan combat troop weight at 210 pounds in violation of TM 55-405-9. AR 95-63, para 1-10b places the responsibility on the SIP to supervise aviator performance. The IP/SIP was not properly supervising the pilot when he gave this advice.	11 US Army Aviation Center improve monitoring of unit SIP's and IP's. The Center should evaluate the supervisory abilities of SIP's and IP's. SIP's and IP's should not only have a broad knowledge of aviation procedures, but they should also demonstrate a willingness to research a question if uncertain of its answer.
262	P	1 (Repeat)	29 UH-1H pilot performed inadequate flight planning (incorrectly completed the DD Form 365F) because of inadequate supervision by the weight and balance technician. The DD Form 365C basic weight was incorrect by approximately 200 pounds. At some time during the past five years (since last aircraft weighing) the weight and balance records were not properly maintained by the weight and balance technician as required by AR 95-16.	3 DARCOM revise AR 95-16 to require UH-1 aircraft be weighed at least every 30 months. This will improve the accuracy of weight and balance records since it is known that aircraft "grow" over extended periods of time. It will also aid the commanders in supervising weight and balance technicians.

CASE #262 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
262	P	1 (Repeat)	29 (Repeat)	12 Unit commander improve monitoring of the unit weight and balance technician. This could be done by occasional random selection of an aircraft for weighing and review of its weight and balance records.
262	P	1 UH-1H pilot on a unit training mission (ARTEP) performed inadequate flight planning during the mission in violation of TC 1-135 (draft), page B-30. The pilot incorrectly performed the power check in that he did not perform the check with a right crosswind and a tailwind. Since he was already hovering at the estimated torque, the increased power required by more adverse winds would have caused the indicated torque to exceed the estimated torque. As a result of the error, he determined he had a GO torque indication instead of a NO-GO indication. The aircraft took off over gross weight limits, lost RPM and landed hard causing major damage.	2 UH-1H pilot performed inadequate flight planning during the mission (did not perform power check with a right crosswind and a tailwind) because of inadequate unit training. The pilot could not state the proper procedure for performing the power check if winds were present. However, once advised of the proper procedure, he remembered being told to do it that way. The Board concluded he had not been properly trained because he had not been required to perform the task correctly a sufficient number of times to remember it.	2 Unit commander upgrade unit training to insure all aviators know anduse the proper procedures for performing the power check. This could be accomplished in both classroom and flight instruction.

CASE #262 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
262	P	1 (Repeat)	19 UH-1H pilot performed inadequate flight planning during the mission (did not perform power check with a right crosswind and a tailwind) because of inadequate written procedures. The requirement to perform the power check in this manner is not stated in TM 55-1520-210-10 or in STACOM 18 which introduced GO-NO-GO torque check. TM 55-1520-210-10 para 4-19d(2), instructions on using the Hover Chart contradicts the requirements in TC 1-135 task 2101A.	3 DARCOM revise TM 55-1520-210-10, chapter 3 - Normal Procedures, to include instructions on the proper procedures to perform power check.
262	P	1 (Repeat)	19 (Repeat)	6 USAAAVS inform personnel of problems encountered and remedies via FLIGHTFAX. FLIGHTFAX should be used to immediately inform personnel of the proper power check procedures.
262	P	9 UH-1H pilot on a unit training mission (ARTEP) improperly monitored instruments during the power check (TC 1-135 task 2101A). The pilot stated the hover power was 40 PSI while the copilot stated he observed 41 to 42 PSI. Based on the actual gross weight, the aircraft should have hovered at 45 PSI. Since there was a two (2) PSI error in the torque system, the indicated torque should have been 43 PSI.	16 UH-1H pilot improperly monitored instruments (misread the torque gauge) because required equipment is improperly designed. The torque gauge has five (5) PSI reference marks which makes it difficult to interpolate readings to plus or minus one (1) PSI. Since the torque gauge is now used as the only power check instrument, a plus or minus one (1) PSI error is unacceptable.	9 DARCOM redesign the UH-1 torque gauge to make it more readable. The pilot must be able to determine the indicated torque to the closest one PSI.

CASE #263

No action taken other than unit level.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
262	IP	13 UH-1H IP (also squadron SIP) failed to provide required information to a pilot planning a unit training mission (ARTEP) in violation of AR 95-63, para 1-10 and 1-11. The IP advised the pilot to use a planning weight of 210 pounds per combat troop instead of 240 pounds as specified in TM 55-405-9, para 42. As a result, the pilot incorrectly computed the aircraft gross weight on the DD Form 365F. The aircraft took off over gross weight limits, lost RPM, and landed hard causing major damage.	21 UH-1H IP/SIP failed to provide required information (incorrectly advised a pilot on the planning weight of a combat troop) because of inadequate supervision by higher command. The IP/SIP was not aware of the instructions in TM 55-405-9 and he judged 210 pounds per combat troop as adequate. In addition, the IP stated he did not fully understand the new performance charts in the -10. AR 95-63, para 1-8, places the responsibility for assessing the standardization and proficiency of SIP's and IP's on the US Army Aviation Center. This IP/SIP had never received a standardization check from DES since becoming an IP in 1971.	11 US Army Aviation Center improve monitoring of unit SIP's and IP's. Unit SIP's should be evaluated periodically by Aviation Center (DES). SIP's and IP's should also be spot checked by the Center. These evaluations should include a broad range of aviation subjects and the supervisory ability of the SIP/IP. In addition , the Center should communicate more frequently with field units to insure new doctrine and training methods are disseminated and that they are understood.
263		No contributing materiel/failure malfunction.		
263	IP	1 UH-1B Instructor Pilot, while conducting an Additional Flight Training Period (AFTP) inadequately planned a flight before a mission in violation of TM 55-1520-219-10, para 3-9. He attempted an unauthorized flight at an airspeed (40-60 kts) and altitude (11,500'MSL and 13,900'DA) where power required exceeded power available. This power relationship is shown in TM 55-1520-219-10, ch. 14, chart 14-7. As a result, the aircraft began to settle, yawed, and crashed on a rocky mountain slope causing minor damage.	6 UH-1B IP inadequately planned flight (failed to determine power required VS power available for the flight to be flown) because of inadequate judgment. Although an IP and scheduled to perform an instrument training cross-country flight, he disregarded his flight plan and flew to a different point outside the local flying area and then attempted to perform a high altitude reconnaissance (11,400') that exceeded his capabilities and level of training.	7 National Guard Bureau (NGB) should take positive command action to encourage proper performance and discourage improper performance with regard to aviators following written regulations, procedures, or guidelines.

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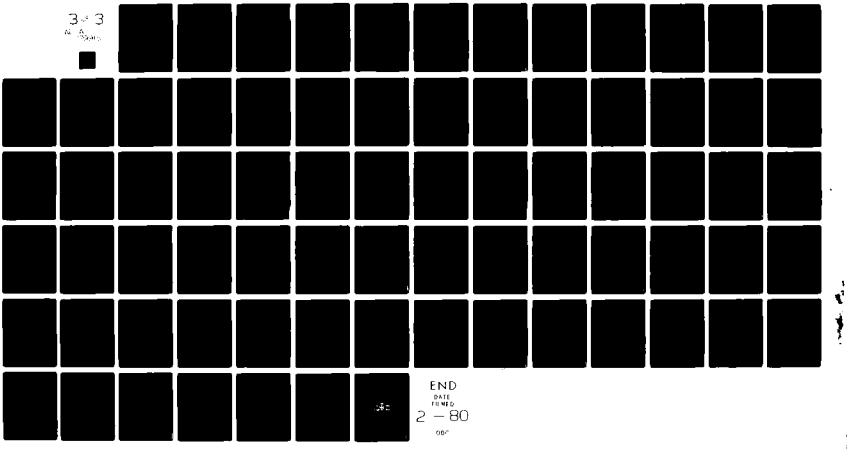

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CASE #264

Insufficient information to perform action.

CASE #265

Actions Completed

Action taken at unit level by consolidating these type aircraft in one unit and restricting the number of personnel who fly them.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
264		No contributing materiel failure/ malfunction.		
264	P	6 UH-1H pilot, during a night takeoff, inaccurately estimated ground clearance. The pilot hovered to an unpaved active runway for takeoff, but encountered so much dust that he decided to hover to the sod area between the active runway and the taxiway for takeoff. During the takeoff from the sod, he inaccurately estimated his height above the ground and allowed the aircraft to settle to the extent that the skids caught on the PSP of an unlighted helipad. This resulted in the skids being torn away. The aircraft was landed with no further damage.	17 UH-1H pilot inaccurately estimated clearance because of inadequate airfield services (lighting). Permanent airfield or helipad lighting was not available. The only lighting on the airfield were those located on the operations building, and those located on the top of a water tower adjacent to the operations building. This lighting, which was not airfield lighting, was insufficient to provide adequate visual cues to alert the pilot to the presence of the helipad and the loss of altitude.	10 Command provide required facilities, such as proper airfield lighting, even if it is of the temporary type, when night operations are being conducted. The presence of lighting would not have corrected the problem of the dust on the active runway, but if the helipad had been lighted, the possibility exists that the mishap would not have occurred.
265		No contributing materiel failure/ malfunction.		
265	IP	7 U-10A IP conducting transition training made an improper flight control action in violation of the landing paragraph, page 2-8, Tech Order 1U-10A-1 (USAF Series Flight Manual U-10A Aircraft dated 1963). When the pilot allowed the aircraft to attain an excessive sink rate in landing, the IP attempted an increase in pitch attitude instead of a power application to recover. This application of aft control caused the downward movement of the tail to accelerate and increased the force with which the tail struck causing damage to the tail section of the aircraft.	3 U-10A IP made improper flight control action (increase pitch attitude instead of making power application) because of inadequate experience. The IP had only 3.2 hours of IP time in the U-10A aircraft during the preceding 12 months and 13.5 hours of fixed wing instructor pilot time during the preceding 19 months.	5 Command should insure personnel are ready/capable of performing job assigned regarding their training and experience by keeping up-to-date and aware of duties, functions, roles, and IP duties of unit IP's which could adversely affect capabilities. To implement this remedial measure, TRADOC should insure that aviation resource management oriented courses of instruction, such as USAAVNC COI 2G-F15, "Aviation Commander's Readiness Course", provide commanders with training and knowledge with which to fulfill this command responsibility.

CASE #266

Action Completed

FLIGHTFAX article, Vol. 6, #42, 9 Aug 78, "Crew Coordination."

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
266		No contributing materiel failure/ malfunction.		
266	IP	10 UH-1H IP on a pilot standardization flight evaluation improperly monitored performance of pilot in contravention of common practice. During deceleration phase of straight-in autorotation, pilot unexpectedly placed aircraft in a nose high attitude as aircraft neared runway. IP did not have his hand properly positioned near a point on the cyclic control that would give him the leverage required to override the pilot. As a result, he was physically unable to correct the nose high attitude prior to the aircraft striking the runway tail rotor first and the aircraft sustaining major damage.	5 UH-1H IP improperly monitored performance of pilot (was not in proper position to override cyclic control error) because of inadequate attention. IP should have adopted an increased state of readiness as aircraft approached critical phase of autorotation. Regardless, he admittedly was "caught by surprise" by abruptness of pilot's actions and was unable to correct the situation prior to touchdown.	7 Unit CO's should take positive command action to insure IP's are attentive and alert during critical stages of nonstandard maneuvers. To implement remedy, unit SIP's should evaluate this aspect of IP proficiency as a matter of special interest during IP standardization flight evaluation.
266	IP	10 (Repeat)	5 (Repeat)	6 USAAAVS inform personnel of problems encountered and remedies concerning inadequate attention via FLIGHTFAX and/ or Aviation Digest.
266	IP	16 UH-1H IP on a pilot standardization flight evaluation failed to perform a course of action required by TC 1-135, para C-2. The IP tasked pilot to perform a straight-in autorotation before giving him a reasonable period of time to practice less complex maneuvers. Accordingly, the IP forfeited an opportunity to develop a more thorough appreciation of the pilot's current proficiency in basic skills. As a result, he was "caught by surprise" when the pilot initiated an unusually nose high deceleration attitude as aircraft neared the runway. The aircraft struck the runway tail rotor first causing major damage to the aircraft.	6 UH-1H IP failed to perform required course of action (tasked pilot to perform an autorotation without ample opportunity to practice less complex maneuvers) because of inadequate judgment. The IP had flown the aircraft previously and had noted that rotor RPM was low during autorotation. Accordingly, he allowed his desire to recheck rotor RPM early in the flight override the usual sequence of maneuvers.	7 Unit CO's should take positive command action to insure IP's conduct standardization flight evaluation rides "by the book" regarding the building block concept of proceeding from simple to more complex maneuvers. This provides an opportunity for the IP to observe the skill level of an aviator being evaluated before proceeding to more complex or critical maneuvers. To implement remedy, unit SIP's should evaluate this aspect of IP proficiency during IP standardization flight evaluations.

CASE #267

No action, other than at unit/local level, being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
266	IP	16 (Repeat)	6 (Repeat)	6 USAAAVS inform personnel of problems encountered and remedies concerning inadequate judgment on the part of IP's via FLIGHTFAX and/or Aviation Digest.
266	P	16 UH-1H pilot on a standardization flight evaluation failed to perform a course of action required by common practice. During deceleration phase of straight-in autorotation, when IP attempted to override the cyclic control to correct a nose high attitude, the pilot failed to respond to the IP's control input. As a result, the aircraft struck the runway tail rotor first causing major damage to the aircraft.	26 UH-1H pilot failed to perform course of action required by common practice (failed to respond to IP control input) because of inadequate supervision by the IP. The IP failed to brief pilot on transfer of control procedures as prescribed by para c-3b (1)(g), TC 1-135.	7 Unit CO's should take positive command action to insure IP's are aware of their responsibility to brief transfer of control procedures prior to conducting flight evaluations. To implement remedy, unit SIP's should emphasize the importance of this requirement during IP flight evaluations.
266	P	16 (Repeat)	26 (Repeat)	6 USAAAVS inform personnel of problems encountered and remedies concerning inadequate supervision by IP's via FLIGHTFAX and/or Aviation Digest.
267	P	No contributing materiel failure/ malfunction.		
267	P	15 The pilot of an OH-6A on a reconnaissance training mission during an ARTEP performed a course of action that is prohibited by common practice. While performing a reconnaissance of a wood line during an ARTEP, the pilot, who was not NOE qualified, was flying at such an altitude that he permitted his main rotor to strike the limbs of trees along the wood line. Strike damage to the rotor blades created such a vibration that the pilot initiated an autorotation and during the landing that followed, the aircraft rolled on its side sustaining major damage.	12 Pilot of an OH-6A performed a course of action that is prohibited by common practice (flew at NOE altitudes while participating in an ARTEP without being NOE qualified) because of excessive self-motivation. The pilot was not assigned to the unit participating in the ARTEP and was therefore excessively motivated to do well for the unit while attached temporarily.	15 Scout platoon leader improve monitoring of personnel, especially those attached to assure they specifically know what is expected of them and to control excess motivation where and when it occurs.

CASE #267 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
267	P	15 (Repeat)	25 Pilot of an OH-6A performed a course of action that is prohibited by common practice (flew at NOE altitudes while participating in an ARTEP without being NOE qualified) because of inadequate supervision by the Platoon Leader. The assignment of flight crews to missions had been relegated to the Platoons. The Scout Platoon Leader, however, did not know which of the pilots assigned/attached to his platoon were NOE qualified and which were not. Consequently he could not provide adequate supervision concerning mission assignments for his crews.	15 Scout Platoon Leader improve monitoring of personnel so as to become thoroughly familiar with the qualifications of all personnel assigned and attached to his unit. Only in this way can he expect to assign crews to missions with any assurance of mission/crew qualification compatibility.
267	P	15 (Repeat)	22 Pilot of an OH-6A performed a course of action that is prohibited by common practice (flew at NOE altitudes while participating in an ARTEP without being NOE qualified) because of inadequate supervision by the Unit Commander. The Unit Commander knew that only about 50% of the troop pilots were NOE qualified but failed to provide adequate guidance as to altitude (AGL) and permitted them to fly NOE without guidance or restriction.	5 Troop Commander should insure personnel are ready/capable of performing job assigned regarding their training (i.e., NOE qualified if expected to fly NOE) and if they have not been sufficiently trained, to provide adequate supervision/guidance so they will know they are not expected to perform in a manner that would exceed their training qualification.

CASE #267 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
267	P	15 (Repeat)	12 Pilot of an OH-6A performed a course of action that is prohibited by common practice (flew at NOE altitudes when participating in an ARTEP without being NOE qualified) because of peer pressure. Army Readiness Region 1 personnel assisting the unit conducting an ARTEP rehearsal the previous week were critical of altitudes being flown and emphasized the need to fly at realistic low altitudes.	5 Army Readiness Region 1 personnel assisting Reserve Component Units insure all personnel are ready/capable of performing job assigned regarding their training before encouraging them to perform in an environment for which the unit is not entirely qualified.
267	P	7 The pilot of an OH-6A on a reconnaissance mission during an ARTEP performed an improper flight control action contrary to common practice. After having experineced one or more tree strikes resulting in vibrations in the aircraft, he elected to enter autorotation to land instead of landing with power. As a result the aircraft touched down with forward movement, the left skid sunk into soft ground and struck an imbedded rock, the aircraft rocked forward and backward and slowly rolled over on its left side.	6 Pilot of an OH-6A performed an improper flight control action (initiated an autorotation and landed without power when common practice would dictate that he land with power) because of inadequate judgment. He elected to enter autorotation to relieve a vibration condition and by doing so, sacrificed control of the aircraft during landing. As a result the aircraft was permitted to slide forward with the left skid sunk into soft ground until it struck an imbedded rock. The aircraft rocked forward and backward, the left skid failed and the aircraft rolled on its left side.	2 Rhode Island National Guard upgrade unit training to emphasize the importance of retaining control of the aircraft with power during all emergencies except those during which power or directional control cannot be maintained. This should be emphasized during all standardization rides.

CASE #268

Actions Completed

1. Internal USAAAVS/DES fixed wing study concluded after landing checks should be accomplished after aircraft is clear of runway.

2. TM 55-1510-208-10, para 8-33, now states that after landing check is to be accomplished after aircraft is clear of runway.

CASE #271

Actions Completed

TSARCOM message 031520Z Aug 78, AH-1-78-14 and UH-1-78-9, subject: Maintenance Advisory Message Requiring Silicone Oil to be added to all T53-L-13B and L703 engine fuel controls.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
268		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
268		Insufficient information to perform a human error (TEIR) analysis.		
269		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
269		Insufficient information to perform a human error (TEIR) analysis.		
270		AGDA		
271		23 AH-1S on a training mission experienced an engine fuel control malfunction. While conducting terrain flight at 20 feet AGL and 40 KIAS over low trees, the P-1 connector adjusting screw (PN 93195) of the fuel control failed resulting in a fuel control malfunction and subsequent engine flame out. The aircraft was autorotated into trees with major damage.	16 AH-1S experienced a fuel control malfunction (P-1 connector adjusting screw PN 93195) because the equipment is improperly designed for required operations. Subject part failed through high cycle, low stress fatigue mechanisms causing the fuel control to respond to false signals and reduce fuel flow to the point the engine lost power and flamed out.	9 DARCOM initiate action to redesign and/or expedite the evaluation and incorporation of new state of the art designs for the T-53 engine fuel controls. (NOTE: CCAD recommends the incorporation of the Lycoming Service Bulletin to incorporate a modification to dampen vibrations in the bellows and connector screw area of the fuel control.)
271		No contributing human error.		
272		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		

CASE #272

Action Completed

Summary of the accident published in FLIGHTFAX, Vol. 6, #36, 28 Jun 78, "Selected Mishap Briefs."

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
272	P	7 UH-1H pilot on a pax delivery service mission made improper flight control actions in violation of TM 55-1520-210-10 para 4-5. The pilot did not adjust airspeed to make the forced landing area he had selected. He maintained 70-80 knots instead of increasing airspeed to the best glide speed of 99 knots. In addition, the pilot selected an area which required extending the glide distance when closer areas were available. As a result, the pilot had to increase collective to clear a tree line, lost rotor RPM, and landed hard causing major damage.	2 UH-1H pilot made improper flight control actions (did not adjust airspeed to make a forced landing area) because of inadequate unit training. The pilot had been omitted from the unit training program because he was the unit maintenance officer. He had been designated as a unit test pilot without ever receiving a "pilot" evaluation flight as required by AR 95-63 para 1-16. He did receive a "currency ride" one month prior to the mishap. However, this ride included only one standard autorotation, one low level autorotation, and one forced landing in the traffic pattern.	2 Commander provide adequate unit training to all unit aviators. Increased emphasis should be placed on standardization and training of maintenance test pilots.
272	P	7 (Repeat)	2 (Repeat)	3 Commander revise administrative procedures in the unit operations to insure all unit aviators receive flight evaluations as required by AR 95-63.
272	P	7 UH-1H pilot on a pax delivery service mission made improper flight control actions in violation of common practice. Early in the deceleration the pilot inadvertantly increased collective to clear a tree line. As a result, rotor RPM decreased and the aircraft had insufficient RPM to complete the autorotation. The aircraft landed hard causing major damage.	5 UH-1H pilot made an improper flight control action (inadvertantly increased collective early in the deceleration) because of inadequate attention. The pilot channelized his attention on the selected forced landing area and was not aware that his flight path was converging on the tree line until too late to select a more suitable course of action.	6 Commander inform personnel of the facts and circumstances of this mishap. This could be accomplished during the next unit safety meeting.

CASE #273

Actions in Progress

1. Since April 1977, the improved bearing (PN 6876005) has been installed in place of the split outer race-type bearing (PN 6876008) during engine overhaul.

2. The T63-A-720 is a product improvement being incorporated in the C model. At the OH-58 User's Conference on 15-16 Jan 79 at Fort Rucker, the user community indicated that the A model also required the 720 engine. Any product improvement initiatives for the A model will be decided on once the ASH Special Study Group findings are available.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTIONS	SYSTEM INADEQUACY	REMEDIAL MEASURE
272	P	7 (Repeat)	5 (Repeat)	6 USAAAVS inform aviators of the hazard of channelized attention during emergencies. This could be accomplished by a summary of this mishap in "FLIGHT FAX."
273		23 OH-58A aircraft experienced a failure of the engine (No. 2 main bearing). The aircraft was at 1700 ft, 80 KIAS, straight and level cruise flight when the engine No. 2 bearing (PN 6876008) failed resulting in engine failure. The aircraft was autorotated to an open field. During touchdown, it encountered spike knock and pylon whirl resulting in major damage.	16 OH-58A experienced an engine (No. 2 bearing) failure due to inadequate design of components. The bearing outer race is of the split design which allows misalignment at the split and induces premature failures from a progressive fatigue mechanism being set up. This results in spalling on the race and ultimate failure of the bearing.	9 TSARCOM expedite purging the system of the 6876008 bearing to preclude future use in the T63-A-700 engine and install the 6876005 bearing, or replace the T63-A-700 engine with the T63-A-720 engine which does not use the 6876008 bearing.
273		No contributing human error.		
274		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
274		Insufficient information to perform a human error (TEIR) analysis.		
275		No contributing materiel failure/ malfunction.		

CASE #275

National Guard Bureau action.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
275	P	7 UH-1H pilot while performing a straight-in autorotation during a standardization check-ride applied improper flight control action. While attempting to reduce the ground slide during his second autorotation he held the deceleration attitude long enough to reduce his forward speed but did not apply sufficient collective pitch to adequately slow the rate of descent. As a result, the aircraft struck the prepared surface hard enough to sustain major damage.	14 UH-1H pilot applied improper flight control action (applied insufficient collective pitch to adequately slow the rate of descent) because of habit interference. The pilot had been assigned to fly an OH-6 primarily, and although he flew occasionally as copilot in a UH-1H, he had not performed an autorotation in a UH-1H since April 1977. These were his first autorotations in a UH-1H in a considerable length of time. Without having had any refresher training per se in preparation for the stan ride, he had not adequately adjusted to the difference in size and control input requirements from the OH-6 to the UH-1H. As a result, the collective pitch control application applied to terminate the autorotation was inadequate for a UH-1H and the aircraft landed excessively hard.	2 Units provide refresher training for aviators in any aircraft the aviator is required to fly as pilot that he has not been maintaining currency in.

CASE #276

Action Completed

TSARCOM issued safety of flight message, subject: One-Time Inspection for UH/AH-1 Aircraft, Concerning Tail Rotor Drive Flex Couplings, TB 55-1500-200-20-22.

Actions in Progress

USASC submitted DA Form 2028 recommending a change to TM 55-1520-210-20 and TM 55-1520-210-34 to require the tail rotor output quill coupling be inspected and relubricated before installation of a new or overhauled transmission.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
275	IP	10 UH-1H IP conducting a standardization ride (training) improperly monitored the performance of personnel (pilot) during autorotation. A second straight-in autorotation was being performed to try to reduce landing slide distance. The IP was assisting the pilot by calling out altitude, airspeed, and rotor RPM from the instruments. The IP did not recognize that the pilot had not applied sufficient collective pitch to satisfactorily control the rate of descent and permit a safe landing. As a result, the aircraft landed extremely hard sustaining major damage.	5 UH-1H IP improperly monitored performance of personnel (pilot) during a standardization ride (did not recognize the pilot had not applied sufficient collective pitch to satisfactorily control the rate of descent during termination of an autorotation) because of inadequate attention. The IP was occupied assisting the pilot by calling out altitude, airspeed, and rotor RPM from the instruments and did not give adequate attention to outside the aircraft. Therefore, he did not relate the rate of descent to the proximity of the landing area and permitted the aircraft to land extremely hard.	7 Positive command action be taken to encourage proper performance and discourage improper performance of instructor pilots by the support facility commander. Emphasis should be placed on appropriate division of their attention during critical phases of all maneuvers.
276		25 UH-1H, on a service mission, experienced a failure of the main transmission tail rotor drive coupling set (PN 204-040-603-7, PN 204-040-604-5) located at the tail rotor drive quill due to abrasive wear mechanisms. The aircraft was in cruise flight between 5000 and 6000 feet MSL under IFR conditions when the failure occurred causing a loss of tail rotor thrust. At approximately 100 feet AGL witnesses reported the aircraft spinning around the mast. The rotor separated, the aircraft inverted and crashed.	19 UH-1H main transmission tail rotor drive coupling set failed due to abrasive wear mechanisms caused by inadequate written procedures. The main transmission had been in storage for three years and had just recently been installed on the aircraft. TM 55-1520-210-20 and TM 55-1520-210-34 have no specific requirement to inspect for adequate lubrication of the quill when a new or overhauled transmission is installed. This component either had little or no grease when installed resulting in failure of the coupling.	3 DARCOM revise TM 55-1520-210-20 and TM 55-1520-210-34 to include a requirement to disassemble, inspect and relubricate couplings prior to the installation of a new or overhauled transmission

CASE #277

Action Completed

1. TSARCOM issued maintenance advisory message, 251400Z Aug 78, UH-1-78-10, AH-1-78-16. Contains instruction for removing the steel tags, inspecting and replacing lines if necessary and retagging with aluminum tags.

2. FLIGHTFAX article, Vol. 6, #46, 6 Sep 78, "Don't Let This Happen To You."

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
276		25 (Repeat)	19 (Repeat)	11 DARCOM improve monitoring of overhaul activities to insure that proper maintenance procedures are being adhered to.
276		25 (Repeat)	19 (Repeat)	18 DARCOM perform research to determine solution to system inadequacy. Current storage procedures should be evaluated to determine the effect of time (over two years) upon lubricants and seal deterioration and displacement.
276		No contributing human error.		
277		30 UH-1H hydraulic system: flight controls failed. While at an 8-10 ft hover in a tactical LZ, as the aircraft cleared a woodline laterally and began a left pedal turn in preparation for takeoff, the IP experienced hydraulic system failure, temporarily lost control of the aircraft and could not prevent the aircraft tail boom from striking the ground resulting in minor damage to the aircraft.	19 UH-1H hydraulic system: flight controls failed as a result of a rupture in the right cyclic servo high pressure line because of inadequate written procedures for normal maintenance. TB 750-125 dated 15 September 1966 required an identification band of steel be attached to a newly fabricated teflon line. Change 2 to TB 750-125 dated 15 June 1971 changed the composition of the identification band from steel to aluminum alloy but the system was never required to be purged of the steel bands attached during the period 15 September 1966 to 15 June 1971. The band on this line chaffed the steel mesh covering the line until it was so weakened, it would no longer contain the pressure required and the line burst.	3 DARCOM revise TB 750-125 to require removal of metal bands placed on teflon lines when pressure tested, when the line is installed on the aircraft and require removal of all bands from previously installed teflon lines during the next phase inspection or require a one-time inspection to identify and remove bands, from teflon lines, composed of other than the aluminum alloy specified in Change 2, TB 750-125.

CASE # 277 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
277		30 (Repeat)	19 UH-1H hydraulic system: flight controls failed as a result of a loss of hydraulic system pressure of which the hydraulic pressure switch failed to warn the pilot because of inadequate written procedures for scheduled maintenance. There is no requirement, during any phase of scheduled maintenance, to check the operational capability of the hydraulic pressure switch after it is installed on the aircraft initially. Therefore, unless there is another hydraulic system malfunction which indicates a possible pressure switch failure, the pressure switch can be inoperative for a considerable length of time, undetermined, until it results in a control malfunction that may be catastrophic.	3 DARCOM revise procedures for scheduled maintenance to test the hydraulic pressure switch, during phase inspection, with a hydraulic test stand to determine if it is still functioning as it should. It could also be checked electronically to determine the amount of resistance built up across the switch that would indicate a probable malfunction in the near future.
277		30 (Repeat)	19 (Repeat)	9 DARCOM provide a hydraulic pressure switch with improved reliability. Statistics available at USAAAVS identify this switch as being extremely unreliable.
277		No contributing human error.		
278		No contributing materiel failure/ malfunction.		

CASE #280

Actions Completed

1. USAAAVS issued safety of flight message, 042111Z Aug 78, subject: UH-1 Test Flight Procedures.

2. Article published in AEROMEDICAL, "Aspects of Aviation Safety."

3. MWP 55-1500-219-30-6 installation of mast plug released by TSARCOM.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
278		Insufficient information to perform a human error (TEIR) analysis.		
279		Aviation ground accident		
280		26 UH-1H aircraft on a maintenance test flight at 2000' AGL, OGE hover, suffered a failure of the main rotor drive system (mast). The aircraft began to back up during the hover, as the airspeed increased the pilot lost directional control and allowed the aircraft to snap violently to the right at the same time rolling right. The pilot then applied full forward left cyclic to correct this attitude. This caused the static stops on the rotor head to contact the mast and it failed resulting in loss of the main rotor head and blades.	16 UH-1H aircraft suffered a failure of the main rotor drive system (mast) because the system is inadequately designed for the required operating conditions. Flight within the published flight envelope will not produce mast separation; however, during normal and emergency operation of the UH-1H aircraft, it is very easy to unknowingly exceed this flight envelope. Any partial unloading of the system to less than normal "1G" flight, for any reason, combined with an abrupt control input will cause mast separation. Additionally, flight with large sideslip angles and normal control inputs can also produce mast separation.	9 US Army (TSARCOM) in conjunction with Bell Helicopter study the feasibility of modifying the existing UH-1 rotor/mast system to ensure a greater safety margin. A possible solution would be the removal of the current static stops and replacement with a thinner hard rubber stop. This would provide more clearance between mast and stop plus the hard rubber would cause less mast damage on a mild contact.

CASE #280 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
280	P	7 UH-1H pilot on a maintenance test flight mission committed an improper flight control action. During an 1800'-2000' AGL OGE hover the pilot inadvertently allowed his aircraft to draft rearward, to the point of losing directional control of the aircraft. The aircraft rotated violently to the right 180 degrees. The pilot reduced the collective and applied rapid forward left cyclic in an attempt to correct this violent aircraft movement. These rapid control inputs produced an unloaded rotor system and caused the static stops to strike the mast. The blades then struck the fuselage at least 3 times and separated from the aircraft. The aircraft impacted the ground 70 degrees nose down sustaining major total damage.	13 UH-1H pilot committed an improper flight control action, allowed aircraft to enter rearward flight, then after losing directional control, lowered collective and applied full forward, left cyclic to correct his uncontrolled right roll and yaw because of fatigue. The pilot had returned from a 21-day TDY only 2 days prior. During these 2 days he had been observed at very late hours in local establishments. He probably received less than 8 hours sleep in the past 48 hours. He also complained the day before of being extremely tired. These factors caused fatigue and delayed his reaction time and caused an incorrect control input when a reaction was made.	12 Unit Commander improve monitoring of unit activities and personnel to insure compliance with unit SOP and unit crew rest policies.

CASE #280 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
280	P	7 (Repeat)	16 UH-1H pilot committed an improper flight control action, allowed aircraft to enter rearward flight, then after losing directional control, lowered collective and applied full forward left cyclic to correct his uncontrolled right roll and yaw because of inadequately designed instruments. The -219 MTF requires the test pilot to perform an OGE hover at a minimum of 1500' AGL; however, there is no instrumentation in the UH-1H to tell the pilot when he has achieved this condition. He must use outside references only and a headwind will cause the aircraft to move over the ground rearward thus making rearward flight very difficult to detect. This rearward flight, if allowed to develop beyond 10-20 knots, will result in loss of directional control.	9 TSARCOM design an omni-direction airspeed indication system to tell the pilot when he is moving in any direction during this OGE hover.

CASE #280 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
280	P	7 (Repeat)	5 UH-1H pilot committed an improper flight control action, allowed aircraft to enter rearward flight, then after losing directional control, lowered collective and applied full forward left cyclic to correct his uncontrolled right roll and yaw because of inattention during the previous stages of the maneuver. The MTP was probably instructing the CP in the techniques of conducting a maintenance test flight. While accomplishing this task, he was most likely not attending to the developing flight of the aircraft in the rearward direction. Once this became excessive he lost directional control and reacted improperly.	12 Unit Commander improve monitoring of unit activities and personnel to become aware when one individual is being tasked to perform too many tasks to the point of causing inattention to any one task.

CASE #280 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
280	P	7 (Repeat)	7 UH-1H pilot committed an improper flight control action, allowed aircraft to enter rearward flight, then after losing directional control, lowered collective and applied full forward left cyclic to correct his uncontrolled right roll and yaw because of overconfidence in his ability. Having recently completed the maintenance test flight school and having the opportunity to apply the instructional techniques learned there, the MTP tasked himself with (1) instructing and demonstrating test flight techniques, (2) conducting a test flight. These two tasks he had not recently accomplished but he was confident he could handle the tasks.	5 Unit Commander insure unit personnel are ready and capable of performing job assigned in reference to their training. experience and psychophysiological state.
281		No contributing materiel failure/ malfunction.		

CASE #281

Insufficient information to perform action.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
281	P	16 UH-1H pilot conducting a MEDEVAC mission failed to perform a course of action that is required by SOP/TM. As mission commander he did not assure the aircraft was mission ready nor run up as prescribed on page A-3, Annex A, Appendix A of the Med Det (HEL AMB) SOP. Neither did he perform flight planning, takeoff and landing data, nor weight and balance computations as prescribed in Chapter 3, Section II, TM 55-1520-210-10 (paragraphs 3-2 through 3-6). As a result he attempted to fly the aircraft in a density altitude environment with a gross weight for which power required exceeded power available. Engine RPM bled off and the aircraft settled into trees sustaining major damage.	22 UH-1H pilot failed to perform necessary flight planning and computations prescribed in the unit SOP and TM 55-1520-210-10 because of inadequate supervision by the unit commander. The unit commander was aware that aircraft were not being run up completely in preparation for mission readiness and that adequate flight planning IAW TM 55-1520-210-10 was not being performed (computation of takeoff and landing data and aircraft weight and balance). He permitted such unprofessionalism, sacrificing safety supposedly for the sake of responsiveness.	7 Higher command provide positive command action to encourage proper performance and discourage improper performance. The unit commander must be indoctrinated that safe mission accomplishment is predicated on the application of accepted procedures as prescribed in applicable publications.

CASE #281 continued

CASE #282

Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.

Insufficient information to perform a human error (TEIR) analysis.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
281	P	15 UH-1H pilot performing a MEDEVAC mission performed a course of action prohibited by common practice. He performed a reconnaissance for a landing area at 10,000 feet MSL at such a low altitude AGL and low airspeed that when his power required exceeded his power available, he did not have either sufficient altitude or airspeed with which to recover. As a result the engine RPM bled off and the aircraft settled into trees sustaining major damage.	6 UH-1H pilot performed a reconnaissance of an area at such an altitude and airspeed that when his engine RPM began to bleed off, he had neither sufficient altitude nor airspeed to recover because of poor judgement. A high reconnaissance should have been performed ideally at 300'-500' AGL. He should not have been at such a low altitude or airspeed until he selected a landing site and began a low reconnaissance in conjunction with the approach. He had never selected a landing site to approach but reduced his airspeed to approximately 15-25 kts at an altitude approximately 30'-50' feet AGL which did not permit recovery under the emergency conditions encountered.	2 Unit upgrade unit training to emphasize requirement for proper reconnaissance procedures during all MEDEVAC operations.
282		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
282		Insufficient information to perform a human error (TEIR) analysis.		
283		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		

CASE #283

Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.

No contributing human error.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
283		No contributing human error.		
284		No contributing materiel failure/ malfunction.		
284	IP	16 OH-6A IP, while conducting an annual standardization ride, failed to perform a course of action required by common practice. He allowed the pilot, who had not performed a standard autorotation in over a year, to perform the first standard autorotation without first demonstrating one to him. As a result, the pilot used an improper control action causing the aircraft to touch down hard and the main rotor blades to flex down and sever the tail boom.	8 OH-6A IP failed to perform a course of action required by common practice (demonstrate a maneuver prior to allowing rated pilot to perform it) because of overconfidence in the pilot. The IP stated that he normally demonstrated the first autorotation unless he felt the pilot was capable of handling the maneuver. Because the pilot had been performing well up to this point, he decided to let him do the autorotation without a demonstration.	3 USAAVNC (DTD) revise/provide procedures for normal operation. The Aircrew Training Manual Observation Helicopter (TC 1-137) should require that on each standardization flight a demonstration is made for each type of power-off maneuver prior to the pilot performing it. (NOTE: This remedial measure should be applied to all aircraft training circulars.)
284	IP	16 (Repeat)	8 (Repeat)	6 USAAAVS Inform personnel of problems and remedies via publications, and directive messages. USAAAVS should publish an article in the Aviation Digest discussing the hazards of overconfidence. This article should be addressed primarily to IP's.

CASE #284

No action, other than at unit/local level, being taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
284	IP	10 OH-6A IP on an annual standardization flight improperly monitored performance of pilot during a straight-in autorotation in contravention of common practice. During the maneuver he allowed the pilot to establish an excessive steep descent and to improperly apply collective pitch. As a result he failed to prevent the aircraft from touching down in a nose high attitude causing the main rotor to strike the tail boom producing major damage to the aircraft.	6 OH-6A IP improperly monitored performance of pilot (allowed pilot to establish an excessive steep descent and to improperly apply collective pitch during autorotation) because of inadequate judgement. The IP knew this was the pilot's first standard autorotation in over a year yet he allowed the pilot to attempt the maneuver without the benefit of a demonstration.	2 Upgrade unit training to require that during annual flight examination, SIP's evaluate IP's ability to provide timely corrective actions for common student errors. Training should emphasize recognition of two critical points in each maneuver: (1) the point at which the aircraft has departed maneuver parameters in the aircrew training manual and (2) the point at which the IP is approaching the limit of his ability to safely recover aircraft control. As visual capability simulators become available, this training can be safely accomplished in such devices.
284	IP	10 (Repeat)	6 (Repeat)	6 USAAAVS inform personnel of problems encountered and remedies regarding inadequate judgement via FLIGHTFAX and the Aviation Digest.

CASE #286

Actions Completed

Analysis conducted and letter, dated 4 Dec 78, subject: AH-1 Hydraulic Control Malfunctions, was sent to Cobra PM, TSARCOM, requesting that unexplained hydraulic malfunctions be investigated.

Actions in Progress

TSARCOM engineers are conducting an AH-1 hydraulic system assessment.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
284	IP	7 OH-6A IP on an annual standardization flight improperly performed required flight control actions in contravention of the OH-6A Flight Training Guide. During a standard autorotation, the pilot used an excessive amount of collective pitch to slow his rate of descent. By the time the IP got on the controls, the aircraft touched down hard. After ground contact the IP allowed the pilot to lower the collective pitch control before the aircraft came to a complete stop. As a result the main rotor blades flexed down and severed the tail boom.	6 OH-6A IP improperly performed required flight control actions (allowed the pilot to lower the collective pitch control before aircraft came to a complete stop) because of inadequate judgement. Although guidance is available concerning autorotations in the Flight Training Guide, the IP failed to follow it.	12 Unit Commanders should improve monitoring of unit activities. Specifically, the unit standardization program should be closely scrutinized to insure that IP's are adhering to flight training procedures as outlined in the appropriate flight training guides.
284	IP	7 (Repeat)	6 (Repeat)	6 USAAAVS inform personnel of problems encountered and remedies regarding inadequate judgement via FLIGHT FAX and the Aviation Digest.
285		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
285		Insufficient information to perform a human error (TEIR) analysis.		
286		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
286		Insufficient information to perform a human error (TEIR) analysis.		

CASE #287

Actions Completed

TSARCOM SOF message, OH-58-21 (202225Z Sep 78), required a one-time inspection of all OH-58 tail rotor blades.

Actions in Progress

TSARCOM is presently formulating a plan whereby those tail rotor blades below serial number TLL-8000 will be expeditiously purged.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
287		27 OH-58A experienced tail rotor system failure (T/R blade). While in cruise flight at approximately 600 feet AGL and 90 KIAS, the tail rotor blade (PN 206-010-750-5), separated 6½ inches from butt resulting in an out of balance condition. Separation of the 90 degree gearbox allowed the remaining blade to partially sever the tailboom just forward of the last hanger bearing. The aircraft continued to disintegrate in flight and terminated with total damage.	16 OH-58A experienced a tail rotor blade failure due to inadequate design of the tail rotor blade structure. The design of the blade retention block allowed a burr at the tip of the retention block tang. This burr acted as a stress riser which started the fatigue mechanism in the blade and resulted in total blade failure.	9 DARCOM initiate action to redesign the tail rotor blades. (NOTE: Tail rotor blades after serial number TLL-8000 incorporate new design features. (Failed blade serial number preceded SN TLL-8000.)
287		Insufficient information to perform a human error (TEIR) analysis.		
288		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
288		Insufficient information to perform a human error (TEIR) analysis.		
289		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
289		No contributing human error.		
290		No contributing materiel failure/ malfunction.		

CASE #290

No action taken other than unit level.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
290	P	16 A UH-1H pilot (designated PIC), when preparing for recovery of a fallen mountain climber (service mission), failed to perform a course of action required by TM. He neither determined himself nor required his copilot to determine the flight planning, takeoff and landing data, or weight and balance information prescribed in paragraphs 3-4 through 3-6, TM 55-1520-210-10. As a result, the aircraft was permitted to be loaded over the allowable gross weight for the existing density altitude conditions. During takeoff the engine RPM bled off and the aircraft settled into a boulder field sustaining major damage.	2 A UH-1H pilot preparing for a search and rescue mission failed to determine the flight planning, takeoff and landing data, and weight and balance information prescribed in the TM because of inadequate unit training. Unit training does not place sufficient emphasis on the use of flight planning, takeoff and landing data, or weight and balance information to assure acceptance and continuous use of the procedures and planning data provided in TM 55-1520-210-10 by unit aviators.	2 Unit upgrade training to assure unit aviators understand the procedures involved and have confidence in total flight planning to include the use of published takeoff and landing data and weight and balance information. TC 1-10 entitled "Mountain Flying Sense" is considered an excellent reference for this type training.
290	P	16 (Repeat)	2 (Repeat)	18 DARCOM perform research to develop a device that will provide aviators with a quick and convenient method of determining aircraft performance relative to mission requirements and ambient conditions. Such a device should be readily usable both for preflight and inflight planning. A "whirlwheel" type circular calculator or a digital electronic calculator should be considered for development to satisfy this requirement.
291		No contributing materiel failure/ malfunction.		

CASE #291

Insufficient information to perform action.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
291	IP	6 UH-1H Instructor Pilot conducting standardization evaluation ride inaccurately estimated clearance/closure rate of aircraft to ground in contravention of common practice. During landing phase of straight-in autorotation, IP failed to apply initial collective pitch in time to prevent contact between tail rotor blades and ground. As a result, the tail rotor gearbox and tail rotor blades separated from the pylon and the aircraft pitched forward, rolled left and came to rest inverted.	6 Instructor Pilot inaccurately estimated clearance/closure rate (did not apply initial collective pitch in time to prevent contact between tail rotor blades and ground) because of inadequate judgement. Autorotation was performed on a heading of 240 degrees when reported winds were 080 degrees at six knots. When a slightly higher than normal airspeed (90 KIAS) and faster than normal sink rate (autorotation was entered in left turn and main rotor RPM noted in high green) were encountered on final, the IP compensated by entering deceleration at a height above the ground in excess of 100' AGL instead of choosing a more suitable alternative. This course of action placed the aircraft in a higher than normal nose up attitude as the aircraft neared touchdown. The IP failed to compensate for this nose high attitude by either leveling the skids and/or initiating pitch pull.	5 Unit commander should insure unit IP's are capable of properly judging rate of closure during autorotations. To implement remedy, unit and/or Flight Facility SIP's should be tasked to more thoroughly evaluate this aspect of IP proficiency during scheduled standardization rides.
291	IP	6 (Repeat)	6 (Repeat)	6 USAAAVS inform personnel of the highlights of this mishap and lessons to be learned via "FLIGHT FAX" and/or "Aviation Digest".

CASE #292

No actions taken.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
291	IP	6 (Repeat)	3 Instructor Pilot inaccurately estimated clearance/closure rate (did not apply initial collective pitch in time to prevent contact between tail rotor blades and ground) because of inadequate recent experience in performing straight-in autorotations. A review of the IP's flight records revealed that he was primarily utilized as an NOE IP. Otherwise, his flight records indicated that he had logged only 2.4 hours of flight time the previous seven months since his last stan ride wherein the mission required him to perform and/or demonstrate straight-in autorotations.	12 Unit commander should improve monitoring of unit IP's to insure that they are currently experienced in performing non-standard maneuvers. To implement remedy, although it is acknowledged that current policy requires only one stan ride per year for IP's, the unit CO should either encourage unit IP's to take full advantage of opportunities available to maintain their autorotative proficiency otherwise or insure that the frequency of flight training periods requiring the conduct of non-standard maneuvers be increased.
292		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
292	P	6 UH-1H pilot on a night service mission was making an emergency descent following a materiel failure and improperly estimated clearance/closure rate of descent. As a result, he made an improper flight control action in that he increased collective pitch to cushion touchdown at too high an altitude contrary to TM 55-1520-210-10, Chapter 4, Figure 4-2, Approach and Landing - Power Off. As a result, the main rotor RPM went below that required to maintain lifting force; the aircraft fell through, impacting very hard (approximately 3000 feet per minute) and burned after impact.	15 UH-1H pilot (flying from CP seat) improperly estimated clearance/closure rate during a night autorotation because of environmental influence. The CP collective control does not have a switch to turn on the landing/search light. As a result, the pilot (in the CP seat) could not turn on the light to illuminate the landing area. This lack of light caused him to pull pitch too high resulting in loss of rotor RPM and hard landing.	9 DARCOM redesign and modify left (copilot's) collective pitch control lever switch box assembly to provide for landing light and searchlight switch in the standard manner as the right (pilot's) collective pitch control lever switch box assembly. This would provide copilot ability to increase illumination level of area without removing hands from flight controls or verbally requesting such action from another crewmember.

CASE #293

Actions Completed

1. Insufficient information for action.

2. FLIGHTFAX article (Vol. 6, No. 43, 16 Aug 78), fixed wing mishap briefs, provided brief description of this mishap.

CASE #294

Action Completed

TSARCOM issued maintenance advisory message, 172030Z Oct 78, concerning UH-1C/M series helicopter main rotor hydraulic servo cylinder installation (UH-1-78-13).

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
292	P	6 (Repeat)	16 Pilot improperly estimated clearance/closure rate of deacent resulting in a hard impact because equipment is not available for required operation. Control movements to properly cushion landing without adequate visual cues require altitude information accurate to within one to five feet. UH-1H is not instrumented to provide crews altitude information with this accuracy.	9 DARCOM initiate actions to install a radar altimeter to provide accurate altitude information to crewmembers at the controls.
293		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
293		Insufficient information to perform a human error (TEIR) analysis.		
294		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
294		No contributing human error.		
295	AGDA			
296		No contributing materiel failure/ malfunction.		

CASE #296

No action taken other than unit level.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
296	IP	10 UH-1H instructor pilot, during a formal course of instruction, improperly monitored the performance of personnel (student pilot). During the performance of a NOE quick stop flight maneuver, which was the student pilot's first flight maneuver of the day, the student pilot failed to maintain a constant tail rotor altitude and a tail rotor ground strike occurred before the instructor pilot, who was preoccupied with a radio transmission, could regain control of the aircraft. Major damage resulted from the tail rotor strike and subsequent hard landing.	8 UH-1H instructor pilot improperly monitored the performance of the student pilot because of his overconfidence in others (the student pilot). The IP was lulled into a sense of overconfidence by the student pilot's successful completion, without problems, of three NOE quick stop maneuvers the previous day. As a result of this overconfidence, the IP attempted to concurrently operate the aircraft radios and monitor the student pilot's performance of the maneuver. The student pilot failed to maintain constant altitude of the tail rotor and a ground strike occurred before the IP could initiate corrective action.	6 USAAVNS inform personnel of problems encountered due to overconfidence. Instructor Pilots should be briefed and frequently reminded concerning the necessity of anticipating student pilot actions in sufficient time to apply timely corrective actions. IP's working with initial entry students must be extra alert in anticipating student actions as the student does not have the flight experience necessary to establish habit patterns which the IP can rely upon in anticipating student actions to given situations.
297		Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.		
297		Insufficient information to perform a human error (TEIR) analysis.		
298		No contributing materiel failure/ malfunctions.		

CASE #298

Insufficient information to perform a materiel failure/malfunction (FIRE) analysis.

Insufficient information to perform a human error (TEIR) analysis.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
298	P	16 An AH-1G pilot, while preparing for NOE training, failed to perform a course of action required by the TM. He neglected to complete the flight planning for the flight by ignoring the information provided in figure 7-5 contrary to instructions provided in paragraphs 3-3 through 3-5, TM 55-1520-221-10, (AH-1G Operator's Manual). The aircraft was then operated in an "unplanned for" environment in which the tail rotor control critical wind azimuth was exceeded (8300 lbs. gross weight, DA 1000' relative wind 16 G 24 knots from azimuth angle of 060 degrees) and in which insufficient altitude (200 feet AGL) precluded recovery from the resultant uncontrolled turn and descent. As a result, the aircraft descended into heavily wooded terrain sustaining major damage.	2 An AH-1G pilot, while preparing for NOE training, did not consider the information provided in the tail rotor flight envelope chart (figure 7-5) because of inadequate unit training. Unit training does not place sufficient emphasis on the use of performance charts provided in Chapter 14 nor on the use of operating limitations provided in Chapter 7 to assure routine, continuous use of the procedures and planning data provided in TM 55-1520-221-10, by unit aviators.	2 Unit upgrade training to assure unit aviators understand and have confidence in use of operating limitations provided in Chapter 7 and performance data provided in Chapter 14 of TM 55-1520-221-10 and routinely use the information provided during pre-mission planning for terrain flight or mountain flight as prescribed in FM 1-1, Terrain Flying and TC 1-10, Mountain Flying. This can be accomplished by unit and/or facility instructor pilots reviewing with all aviators of Troop E, 19th Cavalry Squadron the correct planning sequence covered in TM 55-1520-221-10, FM 1-1, Terrain Flying and TC 1-10, Mountain Flying.
298	P	16 (Repeat)	2 (Repeat)	3 USAAAVS provide information on procedures for normal operation. The power available vs power required charts in Chapter 14 and tail rotor limits chart in Chapter 7 of TM 55-1520-221-10 should be reproduced in the form of posters to be used in unit operations for pre-flight planning.

CASE #298

Actions in Progress:

TSARCOM is evaluating feasibility of an on-board electronic calculator programmed for weight and balance and aircraft performance calculations.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
298	P	16 (Repeat)	2 (Repeat)	18 DARCOM perform research to develop a device that will provide aviators with a quick and convenient method of determining aircraft performance relative to mission requirements and ambient conditions. Such a device should be readily usable both for pre-flight and inflight planning. A "whiz-wheel" type, circular calculator or a digital electronic calculator should be considered for development to satisfy this requirement.

CASE #299

Refer to Case #252 for actions completed and in progress.

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
299		27 OH-58A aircraft experienced a tail-rotor system malfunction. At 40-50 feet AGL on a normal approach and at an airspeed below effective translational lift, the pilot applied power (collective) to initiate a go-around. At this point, the tail rotor failed to provide sufficient thrust for aircraft control. Although the aircraft was technically being operated within performance/design limits, application of left pedal throughout its full range failed to stop the aircraft from turning to the right (right yaw). The pilot reduced power and attempted to autorotate from a position within the avoid area on the height/velocity diagram. Major damage was sustained on ground contact.	16 OH-58A aircraft experienced a tail rotor system malfunction due to inadequate design of the tail rotor system. The maximum designed thrust available from the tail rotor blades at normal operating RPM in conditions of low airspeed, OGE, and while operating the aircraft at near maximum power available, is insufficient to stop a high steady-state yaw rate that can be developed by the aircraft (Ref USAASTA Proj. No. 68-30).	18 DARCOM perform studies/research to determine solution to system inadequacy. To implement remedy, a test plan must be developed which explores the low speed (10-30 knots) yaw maneuver handling qualities of the OH-58A aircraft. These tests should be conducted at moderately high gross weights in the presence of winds (5 to 10 knots) from varying wind azimuths. Mathematical or wind tunnel models could be used to initially identify critical wind magnitudes and azimuths. Flight testing should be conducted to investigate what combinations of wind velocity, azimuth, and airspeed critically affect the thrust output of the tail rotor, especially during conditions of flight wherein the power required to sustain flight borders on exceeding power available. Concurrently, recovery methods must be clearly defined and expeditiously publicized via current OH-58A "Operator's Manual" and training publications.

CASE #299 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
299		27 (Repeat)	16 (Repeat)	6 USAAAVS inform personnel of the OH-58A tail rotor design inadequacy identified in this mishap and remedies. To implement this action, USAAAVS will: (1) Publicize the highlights of this mishap via "FLIGHTFAX" (See Vol. 6, No. 47, 13 Sep 78), (2) Publicize the phenomenon of tail rotor stall and how it may occur via "FLIGHTFAX" (See Vol. 6, No 47, 13 Sep 78) (3) Advise OH-58A users of interim measures to be taken to reduce the risk of inducing loss of effective left pedal tail rotor authority pending the results of further test and evaluation of the OH-58A tail-rotor system (See Safety of Flight message, "OH-58A Tail Rotor Stall", 241925Z, October 1978).

CASE #299 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
299	P	15 OH-58A pilot on an ATM flight performed a course of action prohibited by para 4-1r, TC 1-37. During a normal approach to land in a confined area, the pilot failed to add power (collective) to perform a go-around until the aircraft had slowed to an airspeed less than required for effective translational lift and the amount of power required to perform the maneuver bordered on exceeding power available. As a result, the aircraft yawed to the right and continued to turn to the right about its vertical axis through two full revolutions regardless of left pedal input. At this point, the pilot elected to close the throttle in an attempt to stop the turn and enter autorotation. As the autorotation was performed from an altitude and airspeed within the avoid area of the aircraft's height/velocity diagram, a hard landing became inevitable and the aircraft sustained major damage upon touchdown.	6 OH-58A pilot performed a prohibited course of action (delayed go-around until aircraft was slowing to an airspeed less than required for effective translational lift) because of inadequate judgment. During high recon, it should have been obvious to the pilot that the confined area selected for landing was, at best, marginal relative to obstacle clearance during touchdown. Regardless, he elected to attempt a landing approach to the area instead of conducting a more thorough reconnaissance or proceeding to a more suitable landing area.	5 Unit commander take positive command action to insure personnel are capable of performing job assigned. To implement remedy, unit IP's must evaluate aviator judgment in the selection of confined areas as a matter of special interest during evaluation rides.
299	P	15 (Repeat)	6 (Repeat)	6 USAAAVS inform personnel of the judgment inadequacy identified in this mishap and remedies via "FLIGHT FAX" and/or "Aviation Digest".

CASE #299 continued

CASE NUMBER	DUTY POSITION		TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
299	P	15 (Repeat)		1 OH-58A pilot performed a prohibited course of action (delayed go-around until aircraft was slowing to an airspeed less than required for effective translational lift) because of inadequate school training. Current OH-58A transition training does not familiarize personnel with how left pedal tailrotor authority can be exceeded when the aircraft is flown at slow airspeed in conditions of gross weight, pressure altitude, air temperature, and wind that create a power requirement bordering on exceeding power available.	1 TRADOC upgrade school training to familiarize personnel undergoing OH-58A transition training with how to recognize, avoid, and/or cope with loss of left pedal tailrotor authority. To implement remedy, USAAVNC, in conjunction with an AVRADCOM re-evaluation and testing of the OH-58A tailrotor system, should develop training measures that will safely fulfill this requirement.
299	P	15 (Repeat)		1 (Repeat)	6 USAAAVS inform personnel of the training inadequacy and remedies identified in this mishap via "FLIGHT FAX" and/or "Aviation Digest".
299	P	15 (Repeat)		19 OH-58A pilot performed a prohibited course of action (delayed go-around until after aircraft was slowing to an airspeed less than required for effective translational lift) because of inadequate written procedures for normal operations. The current -10, "Operator's Manual", for the OH-58A aircraft does not address loss of left pedal tailrotor authority as a possible consequence of operating the aircraft at slow airspeed in conditions of flight wherein power required borders on exceeding power available.	3 DARCOM revise TM 55-1520-228-10, "Operator's Manual" to caution pilots as to the possible loss of left pedal tailrotor authority that can occur when the aircraft is flown at slow airspeed in conditions of flight wherein power required borders on exceeding power available. To implement remedy, a simple graph, caution, or warning should be incorporated in the Operator's Manual to achieve this objective.

CASE #300

Refer to Case #224 for actions completed and in progress.

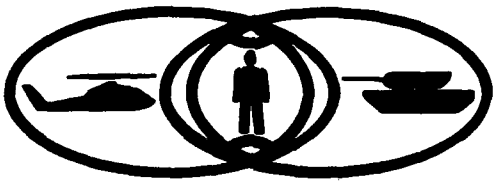
CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
299	P	15 (Repeat)	19 (Repeat)	6 USAAAVS inform personnel of the inadequate written procedures identified in this mishap and remedies via "FLIGHT FAX" and/or "Aviation Digest".
300		No contributing materiel failure/ malfunction.		
300	IP	7 OH-58A instructor pilot on a REFORGER tactical NOE mission, performed an improper flight control action (operated at excessive speed), during a flight to reposition his aircraft to higher ground. FM 1-1 indicates airspeeds to be used during NOE flight, at this altitude, 33 feet AGL, and these terrain features, rolling hills, with treelines and the reduced ambient light, the airspeed selected by the IP, 65 knots, was excessive. This caused the aircraft to strike two power lines, severing the main rotor push-pull tubes, and impact the ground causing total loss.	12 OH-58A instructor pilot made an improper flight control action (excessive speed) because of excessive motivation to succeed. The IP had a false sense of urgency due to the oncoming "enemy" tanks and flew the aircraft rapidly (65 knots) at low altitude to expedite his repositioning.	6 Unit commander and unit safety officer should inform unit aviators of hazards involved when operating at NOE altitudes with emphasis on the recognition and reaction time reduction with increases in airspeed.
300	IP	7 (Repeat)	13 OH-58A instructor pilot made an improper flight control action (excessive speed) because of fatigue. The unit had been participating in REFORGER for three days. During this time this IP flew 23.5 hours of terrain flight with two 6.5 hour sleep periods each night. The fatigue caused a reduced sense of awareness and contributed to his decision to fly low and fast.	3 Unit commander and unit safety officer establish a crew rest policy for both garrison and field activities. This policy must be in writing, be made available to all personnel, and be strictly enforced by the unit commander.

CASE #300 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
300	IP	7 (Repeat)	13 (Repeat)	3 Aviation Officer provide guidance to all aviation units to assist them in preparing unit crew rest policies.
300	P	1 Scout Platoon leader/OH-58A pilot on a REFORGER tactical NOE mission performed inadequate flight planning (hazard analysis) prior to the mission, in violation of FM 1-1, and AR 95-1. He suspected the "enemy" tanks were nearing his position and elected to reposition to higher ground for better visibility. He failed to plot his route to the higher ground to ensure hazard clearance and, as a result, the aircraft struck two power lines which severed the main rotor push-pull tubes and caused an uncontrolled crash and total loss.	12 Scout platoon leader/OH-58A pilot performed inadequate flight planning (hazard analysis) because of excessive motivation to succeed. The platoon leader had a false sense of urgency due to oncoming "enemy" tanks and elected to hurry his departure without proper hazard analysis.	7 Cmdr provide positive command action to encourage proper performance (flight planning). This can be accomplished by stressing proper task priorities and by disciplinary action as appropriate to encourage compliance.
300	P	1 (Repeat)	7 Scout platoon leader/OH-58A pilot performed inadequate flight planning (hazard analysis) because of over-confidence in himself. The platoon leader had chosen his most experienced IP to fly with him on this exercise. He was confident this man could handle any flight. Also, the move was only a short distance and he was confident he could lead his platoon to the new site without a hazard analysis.	6 All command levels inform personnel of hazards involved when adequate flight planning is not conducted. All mission planning must be IAW FM 1-1 and AR 95-1 regardless of the "tactical" situation.

CASE #300 continued

CASE NUMBER	DUTY POSITION	TASK ERROR OR FAILURE/MALFUNCTION	SYSTEM INADEQUACY	REMEDIAL MEASURE
300	LCO	13 Commander during a REFORGER tactical, terrain flying, field problem failed to provide required information (crew rest policy) for his aviation personnel. The commander had not established a formal crew rest policy and felt that during a field problem it was not needed as the mission was more important. This resulted in his scout pilots flying between 22-28 hours NOE each in a three-day period with 12-15 hours rest. As a result, and OH-58A contacted wire and was destroyed.	12 Commander failed to provide required information (crew rest policy) because of excessive motivation to succeed. The commander placed all his emphasis on the "tactical" mission and showed disregard for any other considerations. This resulted in excess flight hours for crews, inadequate rest periods, insufficient time to maintain aircraft, and a totally hurried atmosphere in the unit.	3 Unit commander and unit safety officer establish a crew rest policy for both garrison and field activities. This policy must be in writing, be made available to all personnel, and be strictly enforced by the unit commander.
300	LCO	13 (Repeat)	12 (Repeat)	1 DA upgrade training during senior service college courses on necessities for crew rest in all aviation organizations at current manning levels.
300	LCO	13 (Repeat)	12 (Repeat)	18 DA conduct a study of TO&E's to determine those organizations which cannot provide adequate support from resources without degrading of capacity to safely perform their mission.



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